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ABSTRACT

Three stages of linear causal model building procedures (conceptual, main theory, and auxiliary theory) were used to examine the cultural and personality resources of individuals and their school-related skills as determinants of achievement in mother tongue literature. A path analytic approach was used to test a popular model of literature achievement among a subsample of Swedish 14-year-olds. A pooling procedure was used for controlling the influence of sex and the amount of effort expended on school work. Analysis showed that both the cultural resources of the student's home and his verbal ability, as mediated by his level of reading comprehension, account for most of the explained variance in the model. Some conventional beliefs regarding achievement in literature were not supported by the analysis. Thus, variables such as reading speed, the hours spent reading for pleasure, and literary attitudes had negligible effects and were omitted from the final revised form of the model. The final form was composed of policy variables potentially manipulatable by within-school teaching strategies. (Author/HOD)

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Achievement in Mother Tongue Literature

Some Strategies of Causal Analysis

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ACHIEVEMENT IN MOTHER TONGUE LITERATURE: SOME STRATEGIES OF CAUSAL ANALYSIS

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ABSTRACT

This paper focuses on the cultural and personality resources of individuals and their school related skills as determinants of achievement in mother tongue literature. A path analytic approach is used to test a popular model of literature achievement which is applied to a subsample of Swedish 14-year olds selected from the data bank archive of the International Association for the Evaluation of Educational Achievement, University of Stockholm. Because the sex of the student and the amount of effort expended on school work accounts for variance in levels of performance over-and-above the causally interrelated system factors, it is necessary to control for the possibility of their confounding influence. Accordingly, a "pooling" procedure is used for adjusting the correlation matrix inorder to account for the bias in the regression model which is attributable to these factors. The analysis shows that both the cultural resources of the student's home, and his verbal ability, as mediated by his level of reading comprehension account for most of the "explained" variance in the model. Some conventional beliefs regarding achievement in literature were not supported by the analysis. Thus, variables such as reading speed, the hours spent reading for pleasure, and literary attitudes, were shown to have negligible effects and were omitted from the final revised form of the model. Some limitations of the analytical model are referred to, implying the need for additional respecification of the functional form of the model; hence, further research. The final form of the simple four variable model, which accounts for almost half the variance, is composed of policy variables potentially manipulable by within-school teaching strategies. There is some discussion of the educational implications of the findings.

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1. INTRODUCTION: CAUSAL MODELS

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In the 1920's, sociologist William Ogburn and geneticist Sewall Wright were junior faculty members at the University of Chicago. Though it is claimed that they occasonally played handball together, one can only conclude that handball and scholarship were not a good mix because it was not until the middle 1960's that the work of these men was brought together by Blalock (1964), Boudon (1965), and Duncan (1966).

Ogburn was best known for his theory of social change, and especially for his concept of "cultural lag", but he was brought to the Department of Sociology at Chicago for his methodological expertise. It was there that he became the first sociologist to apply the, then, very new statistical techniques of partial correlation and multiple regression to the testing of social theories. Simultaneously, in a series of brilliant papers, the geneticist Sewall Wright was developing the method of what he called "path coefficients" -- the mathematical basis of the causal linear model. The method was an extension of the general regression model procedure being used by Ogburn.

In the interim, Wright and others have made extensions to what is referred to today as "path analysis", and there have been scores of applications both in the biomedical and behavioral sciences.[1] Now that path analysis is an analytical tool available to most researchers in economics, sociology, and allied disciplines, there has been a path analysis explosion. The consequences have been referred to as a "paradigm shift".[2]

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Whether or not current developments in social science methodology constitute contributions to a paradigm shift, there seems little doubt that to the extent that the linear causal model can capture the parameters of those human behaviors which are socially patterned and purposive (that is, rule-following), it is likely to remain a potent tool in the armoury of the social scientist. Readers of the educational literature in school achievement will be already familiar with the preliminary findings of the IEA sponsored research through a number of publications.[3] Comber and Keeves (1973:267-285) present the results of a path analytic examination of the causal relationships between the variables accounting for achievement in science for Japanese 14-year olds. An earlier version of path analysis was conducted by Peaker (1967) in which he demonstrated, independently of parallel studies in other countries, the powerful effects of family background factors or early learning conditions on scholastic achievement. Though it is too early to assess the practical consequences of the Comber and Keeves (1973) analysis, since replications have to be made in each of the countries participating in the science survey, there is little doubt that Peaker's (1967) findings had a powerful impact on the structuring of English education. The Plowden Commissioners recommended the establishment of educational priority areas in England which has since been acted on. The policy represents the largest effort made in England in the area of compensatory education for those children in disadvantaged socializing environments. Keeves (1972) also uses the path model procedure in his effort to disentangle school, classroom, and home background effects on school achievement.

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It is reasonable to conclude that the causal linear model is one that will become increasingly used by curriculum theorists and educational researchers investigating problems associated with teaching -- that is, in the development of a theory of teaching. Thus, it is reasonable to predict that these studies will cumulatively contribute to a more sociologically based theory as the relevance of non-school factors in models of teacher effectiveness becomes increasingly apparent. Thirdly, the kind of research made possible by these models is likely to result in changes in current emphases in educational practice; probably not so much because they will suggest radical innovations in teaching or learning strategies, but because they will assist the educator in clearing his attic of a backlog of outworn traditions, myths, and practices that have little relevance for those outcomes of schooling considered desirable and valuable. In this way, perhaps, they will assist in freeing the teacher from the constraints of obsolescence.

One purpose of this study is to procede through the various stages of path analysis by illustrating its application to a problem area familiar to school administrators and mother tongue teachers. The criterion measure of interest is literature achievement. The major purpose of the study, however, is to examine the cultural and personality resources of individuals and their school related skills as determinants of achievement in mother tongue literature.

2 THEORY DEVELOPMENT

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(i) The Conceptual Model

IEA models of school achievement are supportative of the view that regards schools as desirable interpersonal settings for transforming student personalities (inputs) such that approved levels of understanding in the major cognitive modes are achieved, as well as levels of commitment to societal values that will enable the individual to function in a relatively autonomous manner within a national culture. The schools, then, are socializing agencies which extend and complement the functions of the family and other socializing institutions such as the media, youth groups, and the church. As such, they have important resource modification or conversion responsibilities.[4]

One such resource conversion responsibility, seemingly international in scope, is the initiation of the student into the cognitive form which might be properly labelled "the aesthetics of literature", but which is commonly known as literature. As a consequence of effective involvement in, and exposure to, the literature curriculum, the student will become increasingly familiar with the characteristics of the major literary forms such as poetry, drama, the novel, and biography; will develop an awareness of his national literary heritage; an appreciation of the skill of the literary craftsman; and, ideally, an abiding interest in literature as a form of thought which is of intrinsic interest.

The resource conversion properties of schools even though equalized across classrooms, and within classrooms across pupils, are likely to result in unequal

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success. This is because student attributes (inputs) vary, which accounts in turn for the differential responses to the within school and within class interpersonal environments which constitute the resource conversion and transformation settings. Since interest in this paper focuses on explaining variability in school achievement in literature, what is minimally required is the identification of the major determinants of this variability and, if possible, their relative contributions to variance.

The model described thus far has three components -- the personality attributes of students, usually referred to as student background factors, and which are dependent on early learning conditions; school resources, or the within school interpersonal settings where the student resources are transformed or converted; and the achievement outcome in literature. The relationships between these components are illustrated in Figure 1.

Figure 1 about here

The relationships depicted in figure 1 incorporate three fundamental assumptions. First, it is assumed that the student background component is exogenous; that is, not determined by other variables in the model. This predetermined component may be regarded as "given" in the sense that it represents the starting point of the system of relationships on which all other components are dependent. The exogenous component is "given" also in that it requires no further explanation. There are several exogenous variables in some models which, of course, are likely

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to be interrelated, but this is not a problem for the system under consideration. The remaining variables in the model are the endogenous variables because they are inside the system, and completely determined by a linear combination of variables within the system, which are either logically prior exogenous variables or other endogenous variables.

Secondly, it is assumed that, if the variation of an endogenous variable is not completely determined by prior system components, then a residual variable -- some outside factor, or set of unspecified variables, which is assumed not to be correlated with the set of prior variables in the model -- accounts for this unexplained variance. In Figure 1 the student background component represents the exogenous factors (the givens); the school resource component and achievement in literature represent the endogenous components. Because they are endogenous there is the possibility that they are affected by outside factors; hence, the residuals (X_r and X_s) for school resources and school achievement respectively. The outcome variable is literature achievement. Prior variables in the system are the independent variables.[5]

Thirdly, it is assumed that the relationships are recursive in that the causal flow of the model is in one direction. In this conceptual model there are no feedback loops from endogenous to exogenous variables, or between exogenous variables with different orders of causal priority. A recursive model, then, eliminates the possibility of reciprocal linkages between variables.

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(ii) Effect Parameters and Contrasts

In the model represented by Figure 1 which has a single exogenous component and only three components in all, a total of four possible effects can be specified. It is the contrasts between these effects that provide the framework within which proposition-like statements may be formulated. Once a model has been operationalized, hypotheses may be generated by deduction from the propositions.

The effect parameters are as follows. 1. The linear zero-order relationship of the student background component (or composite) on achievement in literature, which may be referred to as the total effects, which can be expressed in the three variable case as the effects of student background both through its impact on school resources, and through its direct impact independently of school resources. Note that the effects between any independent and dependent variable (r_{ij}) in the three variable case can be expressed as the sum of the direct effect of j on i (p_{ij}) plus j's indirect effects on i transmitted via j's direct association with other independent variables in the model. That is, total effect equals direct effect, plus indirect effect.[6]

2. The linear zero-order relationship between the school resource component and achievement in literature (r_{ij}) which constitutes the total direct effect of the school, including that effect attributable to the direct effect of j on i and that effect of j on i attributable to the component of j implementing student background. The same proviso in footnote six applies to this effect parameter also.

3. The direct effect of school resources as distributed independently of, or over and above, the force of student background.

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4. The direct effect of student background apart from the force of the student background component operating via the schools.

These effect parameters can be expressed in terms of explained variance or RSQUARE (R^2). Thus, effect 1 = R_1^2; effect 2 = R_2^2; effect 3 = $R_{12}^2 - R_1^2$; and effect 4 = $R_{12}^2 - R_2^2$; where, R_1^2 = the explained variance of the first component (X_1) or student background; R_2^2 = the explained variance of the second component (X_2) or school resources; R_{12}^2 = the explained variance of the first and second model components together (i.e., $X_1 + X_2$).

Once the effects have been specified it becomes possible to compare six two-way effects; namely, 1 x 2, 1 x 3, 1 x 4, 2 x 3, 2 x 4, and 3 x 4. (a) Comparison of effects 1 and 2 is between the total effect of variations in student background with the total direct effects of the school. In each effect the joint or overlapping variance between components one and two remain unpartitioned. (b) Effects 1 and 3 are between the total effects of student background variations and the partial effects of school variations. That is, the school resource effects are those after the joint variance shared with student background has been removed. The purpose of such a comparison might be to compare the total effects of student attributes on achievement with those other societal variations which operate through the schools but independent of the student background; that is, the "unique" effects of schooling. (c) Contrasting 1 and 4 effects might be for the purpose of estimating the proportion of the student background effect that takes place through the selection of the school attended by the student, and proportion that takes place directly as

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a function of the student's qualities alone. That is, contrasting R_1^2 with $R_{12}^2 - R_2^2$. (d) If one wished to examine the proportion of the school's impact that was distributed independently of differences in student background effects attributable to the personal qualities of the student one would compare effect 2 with effect 3. Effect 2 is the total direct effect of school resources while effect 3 is the effect of school resources after removal of student effects. (e) The comparison of effects 2 and 4 is between the direct effect of the school resources with the direct effect of student qualities independent of school. It would be important to note in this comparison that effect 4 is not the total effect of student background because student background factors help to determine the school resource component. (f) A comparison between effects 3 and 4 would reveal the unique effects of the school resource component acting independently of the student background, with the unique effects of student background operating independently of school resources.

(iii) Model Building Guidelines

In terms of the conceptual model, the general problem may be defined in two ways. First, the hypothesis may be tested that a student's personal resources -- that is, the effects of the internalized prior learning experiences -- have more powerful direct effects on achievement in literature than their indirect effects via school resources, or more recent learning experiences, acting as mediating factors. Alternatively, an estimate may be made as to the extent to which the effects of of the personal attributes of students on literature are mediated by the

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allocation of school resources. In more practical terms the following question may be posed: How much effect does schooling have on achievement in literature over and above those effects which can be attributed to student background factors and other non-school effects?

Drawing on the experiences and strategies adopted by others in this tradition a number of guidelines may be specified. Though four rules or caveats are presented they are not intended to constitute an exhaustive set; others have no doubt been overlooked.[7] First, conceptual models such as the one formulated above are used to guide variable selection. Thus, variables which fall outside its parameters, even though they may contribute in a substantive sense to the reduction of residual effects (e.g., X_8) will be excluded from the model. It is a common "drag net" technique to introduce variables in fully specified models on the grounds that predictive power may be enhaced. For example, in the Figure 1 model a major concern is with the student effects as mediated by school resources and, therefore, the extent to which other social institutions affect literature lies outside the conceptual framework. It would be an error of judgment to add such variables as access or use of community cultural resources such as theatres, drama groups, and libraries. Similarly, a variable such as amount of TV viewing, and/or TV viewing preferences might boost the explained variance, but it would still constitute a specification error since unnecessary variables would have been introduced into the model, thereby nullifying the parsimony and elegance of the causal model.

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A second rule relates to simplicity. Model complexity is a multiplicative function of the number of variables. If the experience of other researchers is useful as a valid guide, then, other things being equal, the fewer the variables, the fewer the technical problems and the easier the scientific processes of model revision. One reason for this is that in models containing a small number of variables -- say, as a general rule of thumb, fewer than seven -- unreasonable results can be more easily detected by inspection; that is, both the path coefficients and the raw coefficients can be tested against researcher experience at first hand. In these "simple" models, then, the researcher is more likely to feel more confident in his control over the analysis and in the decisions leading to revision of the model.

Thus, the trend has been toward the formulation in the first instance of "basic" models, followed by model elaboration in the form of extensions to the basic model. Perhaps the best ongoing example is the work of Duncan, Featherman, and Duncan (1968) which consists largely of extensions to the Blau-Duncan (1967) model. More recently, the work of Williams (1973a, 1973b) may be seen as an extension and elaboration of Eckland's (1971) basic model of cultural deprivation.

Thirdly, it is advisable to consider those variables which are conceptually well defined. One of the problems inhering in school effects models todate has been the inclusion of a large number of explanatory variables which correlate with one another. Technically, this is known as the collinearity problem, and accounts for the possible over-estimation of background effects and the consequent underestimation of

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the effects of conditions operating in the schools themselves (Coleman, 1973; Wiley, 1973). Though the examination of the total, direct, indirect, and other effects made possible by the path analysis approach overcomes this to a degree, the inclusion of variables which lack conceptual clarity makes the relatively unambiguous effects of individual variables difficult to detect. For example, the variable "presence of a dictionary in the home" is a reflection of the presence of other underlying variables such as the educational level of the parents, the parents' encouragement of the child's school-related activities, the presence of other books in the home, and even the vocabulary level of the parents. In other words, the variable "presence of a dictionary" is a surrogate for many things. It may even be a partial definition of the social status of the child's home which adds to the interpretive problem; and especially if these underlying variables are included in the analysis.

A fourth caveat concerns the hierarchical level of the model. A number of expert data analysts have drawn attention to the methodological and interpretive problems of school effects models stemming from the inclusion of variables at two or more hierarchical levels (Hauser, 1970, 1971; Hannan, 1971; Hannan and Burstein, 1973). The unqualified position taken here is that it is essential to specify in causal models the unit level of analysis, and especially when a data set is used which is defined at several levels; for example, where the data consists of variables measured at the level of the pupil, classroom (teacher), or school. School effects data typically contain

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variables at two or three of these levels, such as home background variables at the level of the pupil, and hours in the school day, pupil-teacher ratio and so on, at the level of the school.

The problem is not difficult to understand. Suppose that in a three variable explanatory model the two predictors (independent variables) were correlated with one another. If the effect of the first is examined, ignoring the second; then both its effect and also a spurious effect attributable to its correlation with the second variable will be erroneously considered. This is the classical multicollinearity problem and failure to adjust variables in order to eliminate or reduce one possibility of spuriousness leads to severe interpretive difficulties -- especially in models containing variables defined at different hierarchical levels. Recently, analysts such as Wiley (1973) have suggested adjustment techniques for coping with this problem, while at the same time formulating complex multi-level explanatory models. The preliminary evidence (Wiley and Harnischfeger, 1974) shows that the functional form of models in which variables at one hierarchical level or category are adjusted for those in another are logically more correctly specified than the more traditional multi-level models, where both individual and contextual effects are examined asymmetrically.

Equations 6, 7 and 10, above (sections 5 (i) 2, and 6), are suggestive of some possibilities in this complex area concerning specification errors related to the functional form of auxiliary models. In general, it will be essential for analysts wishing to formulate multi-level models -- especially contextual effects models -- to consider the adjustment procedures currently being formulated by Wiley and others in order to avoid serious specification errors. In the meantime, the prudent position might be one in which, in the absence of adjustments to the variables through the use of

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linear covariance controls, or "pooling" through within-group mean adjustment, individual level models are defined only at the level of the individual, and school level models defined solely at the school level whether the model components are "natural" school level variables or aggregated measures.

Given that the analyst has taken these rules into consideration in the variable selection stage, there is a further second-order principle which deserves some attention. In applied research concerned with practical issues, other things being equal, the analyst might wish to give preference to those variables which are policy manipulable. Thus, with reference to the conceptual model in Figure 1 it would be desirable to select those variables for inclusion in the model which are manipulable to some extent by classroom teachers.

In summary, four guidelines have been presented for governing the variable specification phase of model building. (1) The analyst is advised to restrict variable inclusion to those model components directly relevant to the conceptual model. (2) Test the basic model first before considering elaborate extensions, and minimise technical complications by including as few variables as absolutely necessary

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for the purpose in hand. (3) Consider those variables which are conceptually well defined in that they are not surrogates for a number of underlying properties; and which, if possible, are relatively orthogonal to other variables in the system model. (4) Specify the hierarchical level of the model and ensure, for example, that criterion measures defined at an individual level are regressed on predictors at the same unit level and so on.

(iv) Main Theory

A fully specified conceptual model -- the main theory -- is described below. The unit of analysis is the individual pupil; thus, the model is of the micro variety. The relationships between the variables are fully identified; that is, all possible paths between variables are included, and diagrammed in Figure 2. Hereinafter Figure 2 will be referred to as Model I.

Figure 2 about here

In Model I it is assumed that verbal ability (X_1) and the literacy level of the home (X_2) are both exogenous. The two-headed curved arrow linking the two variables denotes that no assumptions have been made about the causal priorities between them. The remaining four variables in the system are endogenous. The postulated causal relationships between them are represented by unidirectional arrows from the explanatory or determining variable to each variable dependent on it. Residual variables are represented by unidirectional arrows coming from outside the system. Subscripts are attached to the residual symbols to indicate that they are the unmeasured terms.

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In the operational stage the quantities entered beside the arrows are the path coefficients or standardized beta weights. At the conceptual level only the symbolic form (p_{ij}) of the path coefficient whose impact or effect within the system is under consideration is presented. Relationships between exogenous variables are represented by their zero-order associations or correlation coefficients.

An analysis identifying the relative size of each path -- the sizes of the causal flows labelled p_{ij} in Figure 2 -- would require four regression equations:

(a) reading speed as dependent variable, the literacy level of the home and verbal ability as independent;

(b) reading comprehension as dependent, with reading speed, literacy level of the home, and verbal ability as independent;

(c) attitude toward literature as dependent, with reading comprehension, reading speed, literacy level of the home and verbal ability as independent; and finally,

(d) achievement in literature as dependent and all five others as independent.

In terms of standardized path coefficients, the system of equations (a) through (d) which fully identify Model I are as follows:

$$X_3 = p_{32}X_2 + p_{31}X_1 + p_{3n}X_n \quad (1)$$

$$X_4 = p_{43}X_3 + p_{42}X_2 + p_{41}X_1 + p_{4q}X_q \quad (2)$$

$$X_5 = p_{54}X_4 + p_{53}X_3 + p_{52}X_2 + p_{51}X_1 + p_{5r}X_r \quad (3)$$

$$X_6 = p_{65}X_5 + p_{64}X_4 + p_{63}X_3 + p_{62}X_2 + p_{61}X_1 + p_{6s}X_s \quad (4)$$

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It can be inferred from equation 1 that reading rate is a function both of the literacy level of the pupil's home and his verbal ability. On *a priori* grounds it could be assumed that the literacy level of the home environment -- the interpersonal milieu within which the pupil's speech patterns and language skills were developod -- determined in part the verbal ability of the pupil, but the assumption is not necessary in terms of the subsequent analysis, and would only complicate the model to be presented, since it gives rise to the thorny "heredity-environment" issue, without contributing to the issues of more specific concern. Therefore, the variables X_1 and X_2 are presented in Model 1 as exogenous and merely intercorrelated.

It can also be inferred from Model 1, equation 2, that reading comprehension is dependent on the exogenous variables X_1 and X_2, and reading rate (X_3). Recent IEA research has demonstrated quite conclusively that some school outcomes -- such as reading ability -- are more home dependent than others such as achievement in science (Coleman, 1973). Popular beliefs, and to a lesser extent pedagogical beliefs, would seem to support the p_{43} relationship. Thus, widespread attention for several years has been given to speed reading under the assumption that inorder to improve reading ability all one has to do is to speed it up. It is as if the act of burying one myth has promoted the uncritical acceptance of its antithesis.

Not too many years ago it was commonplace for methodology teachers in language arts at teacher training institutions to draw attention to the research which undermined the myth that fast readers were the most inaccurate readers, or its obverse, that slow readers got the most out of what they read (e.g., Tinker, 1939).

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Perhaps not too unnaturally this gave rise to the alternative explanation that if reading rate could be speeded up, then comprehension would improve. More recently, the importance of conditioning factors in the rate-comprehension controversy has been recognized, as researchers have shown that rate interacts with IQ, age, purpose, and reading material (e.g., Blommers and Lindquist, 1944; Shores and Husbands, 1950; McDonald, 1960). Despite such demonstrations of the complexity of the p_{43} relationship, the popular belief is still that rate and comprehension are associated; and furthermore, that comprehension is dependent on rate. If this is the case, and reading is a home dependent skill, then it is plausible to enquire as to the extent of the dependency of reading rate on background factors. This is the purpose of equation 2.[8]

The background factor selected for main theory formulation is labelled "literacy level of the home". The variable probably represents a number of underlying behaviours, such as the vocabulary of the parents, their speech patterns, and language usage. To some extent the variable can be expected to overlap the educational levels of the parents and other structural characteristics of the home such as social class. There is some evidence that variable X_2 may be a powerful proxy. In a recent study, the writer showed that the socioeconomic status of hearing impaired children who had acquired their verbal skills in the controlled setting of a school for the deaf had no effects on their school achievements -- even for such a home dependent subject as English language achievement (Bulcock, 1972). The suggestion here is that in the presence of controls for the literacy level of the home, the effects of status structures such as father's occupation and income as determinants of scholastic performance are considerably reduced.

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The exogenous variable "verbal ability" (X_1) has a longer and more controversial history in educational research than "literacy level". Its major role has been that of the component always present in the construct labelled IQ. The conventional view, supported here, is that verbal ability covaries with such commonly recognized individual differences as comprehension, understanding, and learning. Thus, the nature of verbal ability is such that an individual average on one of these behaviours is likely to be average on all, or the person below average on one is probably below average on all, and so on. It is to be anticipated that the two exogenous variables will be correlated to a moderate extent, in that the literacy level of the home represents an opportunity structure in the absence of which expression of verbal ability may be retarded and vice versa. The relationship may be a nonmonotonic one attributable to the presence of floor and ceiling effects, but this is not a possibility which can be examined by Model 1.

The path model is extended in equation 3 to include the student's attitude toward literature. Based largely on the conventional wisdom it is hypothesized that literary attitudes are a function of both family background and school related factors. There is some empirical support for the hypothesized relationships, though they may be more complex than portrayed in Model 1. Thus, though lower class children tend to hold less favorable attitudes towards schooling than those from higher status backgrounds (Neale & Proshek, 1967; Glick, 1970), the differences may be offset by the fact that lower class students may be more influenced by the teachers in the school (Yee, 1966, 1968). Whether

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the relationship holds up with the variables proposed in this analysis, which are conceptually more precisely defined than are such gross global indicators as social class, is open to test. The proposition is held that if the literacy level of the home is high; if the pupil's verbal ability is also high; that attitudes toward mother tongue literature will be positive. Similarly, if the pupil's reading rate and reading comprehension level are high, then it is expected that they will support positive literary attitudes, and vice versa.

The relationship between attitudes and the criterion measure, achievement in literature, is more ambiguous. The ambiguity is captured by this statement from a recent review of the literature dealing with the relationship between students' attitudes and achievement.

> The relationship between favorable scholastic attitudes and level of academic achievement is functional rather than causal -- that is, academic successes help to promote satisfaction with school, which in turn increases the possibility of future successes (Khan and Weiss, 1973).

In other words, the authors postulate a reciprocal relationship between attitudes and achievements -- one in which there is a feedback loop between achievement and attitudes.[9] If so, then the question of causality must be resolved largely on <u>a priori</u> grounds rather than on the empirical evidence from cross-sectional data. Perhaps the important point to note is that regardless of the direction of the relationship -- that is, whether it is captured by a recursive or a reciprocal model -- there would in either case be a degree of association between the variables. Empirical findings, however, do not always support this theoretical association (Tenenbaum, 1944; Jackson and

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Lahaderne, 1967; and Lahaderne, 1968). Nevertheless, the popular conception is that other things being equal favorable attitudes toward school and school subjects will covary with related achievement outcomes; and this is supported by most recent research findings (Holtzman and Brown, 1968; Khan, 1969; Khan and Roberts, 1970; Williams, 1970). Since the linkages between background factors, school factors, and school related attitudes on achievement in literature have not been examined previously within the framework of a causal model, there would seem to be additional justification for examining attitudes as determinants of achievement in case they act as a powerful mediating phenomenon for prior factors, which may act via attitudes (that is, indirectly, as well as directly). Equation 4 is a test of this hypothesis.

Equation 4 also test the effects of such school related skills as "reading comprehension" (X_4) and reading rate (X_3) on achievement in literature. In this way some general comparison between the exogenous variables (home and personality resources) and the endogenous variables (school related skills and attitudes) is possible.

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3. DEVELOPMENT OF THE AUXILIARY THEORY

Discussion to this point has been in terms of a conceptual model, or what Blalock (1968: 25) refers to as "main theory"; that is, theory linking common language concepts not necessarily directly measurable. In order to test the theory, the data analyst must construct an auxiliary theory which is specific to the research design, the population studied, and the measuring instruments used. This step involves the quantification of the model consisting of the measured counterparts to the components in the conceptual model. Model isomorphism is the major problem at this stage; the most important outcome of which is the generation of a set of testable hypotheses. If the hypotheses are true then both main and auxiliary theories may be true, though this finding will not preclude the possibility that other conceptual models or other auxiliary theories or both may also constitute alternative tests of the hypotheses. If the hypotheses are false, either the main theory or auxiliary theory or both must be modified or rejected. Normally one cannot deduce from a failure to find support for the hypotheses whether the main theory or the auxiliary theory is at fault, which accounts for the element of intuitive inventiveness involved in the research process.

In this section basic information about the sample and subsample selection, the operationalization of variables, and the specification of the effect parameters is presented. The purpose is threefold: (i) to describe the data base and the operationalized measures in order that the reader can estimate the degree of fit between main and auxiliary theory for himself; (ii) to identify the hypotheses; and (iii) to present information

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about the approach used for estimating model parameters.

(i) The Sample

Data for testing Model I was generously provided by the Institute for the Study of International Problems in Education, University of Stockholm. The sample consisted of a five percent random subsample of the IEA stage two Swedish data for Population II subjects. IEA stage two data on science, reading comprehension, and literature achievement was gathered on the same sample at three age levels in ten countries in 1970. Population II consisted of fourteen-year olds, largely at the grade 8 level. The total number of cases in the subsample was 119. This was considered a random sample of a suitable size to provide substantively and statistically significant results without running into unnecessarily high computer costs.

The data was gathered by a series of questionnaire instruments administered over a period of several days (usually three) in the sample schools to the subsamples of randomly selected children. The school was the primary sampling unit (Peaker, 1967b). Approximately 25 pupils in each school out of approximately one hundred and ten schools sampled in each country responded to the test questionnaires. Other questionnaires were completed by students providing information on their social backgrounds, interests, and attitudes. Classroom teachers and school principals also completed questionnaires. In total, over 1200 items of information was available for each student in the population II sample.

The questionnaires were of the omnibus variety in that they were designed to provide information about a number of problems and issues of a practical and theoretical nature related to educational achievement.

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More detailed descriptions of the samples, the instrumentation, and the findings of the stage two surveys can be found in Purves (1973), Thorndike (1973), and Comber and Keeves (1973), as can reliability data for the test and subtest scores. Valuable information about the organization of IEA, the developmental phases of the test and questionnaire instruments, the hypotheses tested by the series of studies, and the analytical designs, is to be found in the two volume Bloom Report (1969). A technical volume describing the sampling design and the statistical model used in the analytical phase is in press (Peaker, nd.).

(ii) Operationalization of Variables

Verbal Ability (X_1) The structure of verbal ability is hierarchical in that abilities at one level are causes of covariation in lower-order abilities, which in turn explain covariance in performance on a number of specifically observed behaviors (Hebb, 1949; Cattell, 1963). The factor model with reference to Wechsler scales of mental ability has been described by Williams (1973a). A component of these models which always emerges is the verbal comprehension factor which is the variable of interest in Model I. The word knowledge test data gathered in the IEA stage two survey effectively captures this dimension of ability which accounts for its use as the measure of verbal ability. In his review of the status of word knowledge in IEA research R. L. Thorndike (1973: 36) concludes that for within-country analyses "it appears that the test should be a reasonably satisfactory measure of verbal ability."

The item format for the word knowledge test consisted of word pairs. The words of each pair had to be judged as approximately either synonyms or antonyms.

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It was believed that such a format would be easier to translate into different languages than other alternatives such as the multiple-choice format.[10] Pools of items were assembled by the International Reading Committee from the national committees in each country. These were classified into ten difficulty levels by a team of expert judges at Teachers College, Columbia University. The major problem was that the order of difficulty in English might (and did) change as a consequence of translation. An attempt to resolve this was made by circulating the list of 300 word pairs to each national committee, with the request that each be asked to indicate which pairs would be impossible or difficult to translate into a pair of corresponding difficulty in the language of the country.

Following this, all word pairs were dropped in which more than one country indicated translation difficulties, and the remainder used for pretesting purposes. The steps for scaling items for difficulty are described in detail by Thorndike (1973: 30-36). Unfortunately there were great variations for the test from country to country, but the discrimination within a country was good; hence, legitimizing its use for the purpose described. The coefficient of reliability for the word knowledge test for Sweden population II was 0.672.

Literacy Level of the Home (X_2) There are at least three noteworthy differences between the variable "literacy level of the home" and that described above as the verbal dimension of mental ability. First, verbal ability is an unmeasured construct. The unmeasured variable can best be seen as the cause of its underlying measured indicators; that is, the structure of factor models such as mental ability or value orientations such as conservatism is hierarchical, in which a

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single general ability or attitude is seen as a cause of the covariation among more specific abilities or attitudes which in turn might account for covariation among performances on a number of tests.

Figure 5 about here

In Figure 5a the unmeasured variable Y is the cause of covariation in two underlying unmeasured dimensions, W_1 and W_2, each of which is the cause in turn of a relatively pure set of underlying measured items. In the case of the construct mental ability, our interest is centered on only one of its underlying dimensions; namely, verbal ability. In terms of Figure 5a interest lies not in the second order construct Y but in one of its first order dimensions; namely, that representing the verbal component of this construct. It is believed that an individual's word knowledge score is a function of his verbal ability and, hence, the score itself represents an accurate and valid measure of the construct.

The variable literacy level of the home is not a factor model like verbal ability. Rather, it is best conceived as a productive model variable in that the underlying indices or measured variables give rise to or "produce" the unmeasured construct. See Figure 5b above. Thus, literacy level of the home can be conceived as an unmeasured variable which is the product of several indicators such as the language fluency of the parents, the degree of commitment to the use of "pure" forms of language usage, the interest of family members in a variety of literary forms, and so on. Such information is difficult to obtain, however, by questionnaire methods and even if an effort was made to gather it in this way it would minimally require

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questionnaire feedback from several family members which in itself is a large undertaking. Not surprisingly, therefore, the IEA questionnaire committee settled for approximate indicators of the construct such as: use of dictionary in the home, number of books in the home, the number of magazines received in the home each month, and whether the family receives a daily newspaper.

Each one of these items may be conceived as a surrogate or proxy for a number of qualities and interests held by a family member (or members) related to a family environment dimension of some presumed importance called literacy level of the home, which is used as one indicator for predicting or determining a child's achievement level in a mode of understanding called the aesthetics of literature. It is condeded that these variables are surrogates or proxies, and possibly for this reason not to be taken too literally. For example, if it were found that the variable "presence of a dictionary in the home" was strongly associated with achievement in literature, then if the association was literally true by adding a dictionary to every home without one, one would expect to bring about an increase in literary achievement. That this would not occur is obvious because the other properties of the home for which the presence of a dictionary is merely a proxy would still be absent.

The second difference, then, between literacy level and verbal ability is that the measured indicators of literacy level are only proxies which fail to reflect the precision and care taken in the construction of the verbal ability variable. It is partly for this reason and partly for pragmatic research considerations that it was thought that the number of books in the home would represent the best

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single proxy for the literacy level of the home construct. The third distinction, then, is that whereas verbal ability is an unmeasured variable based on an individual's score on forty test items, the variable number of books in the home as a proxy for the literacy level of the home is based on a single questionnaire item.[11]

Reading Rate (X_3) The variable "reading rate" was included as one of the achievement measures by the International Reading Comprehension Committee responsible for the preparation of the reading tests for the stage two surveys. The format considered to be the most appropriate for meeting the speed test conditions involved a series of short paragraphs, each followed by a question and three words, one of which had to be underlined as the answer to the question.[12] In this way it was thought (a) that a natural reading situation could be retained, (b) that there would be some guarantee that the material had been read and understood, and (c) that the score would reflect maximum rate of comprehension.

Thorndike (1973: 28-29) draws attention to technical problems involved in the construction of reading speed tests and concludes that no fully satisfactory technique has been developed. Nevertheless, in the development of the final test form every effort was made to eliminate ambiguity and difficulty through analysis of pretest results from each country. On the basis of these try outs, a time limit of four minutes was set for a passage consisting of a single continuous story containing forty items. Answers were marked directly on the test booklet, on the basis of which two scores were obtained: (a) the number of the last item attempted without regard to correctness, and (b) an error score based on the first nine items of the test. For the purposes of this study only the first of these scores was used.

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Reading Comprehension (X_4) The reading comprehension variable was also constructed under the direction of Robert L. Thorndike of Columbia University. The test was of the conventional type -- a reading passage followed by multiple choice questions on the passage designed to cover a wide range of reading skills, such as identifying factual details and the main idea; inferring beyond the literal content; recognizing the author's point of view and purpose; and demonstrating an understanding of the author's writing techniques. Both the population II tests were 45 minutes in length, and included a total of eight passages with 52 test items. The items covered a wide spread of difficulty; thus, discriminating satisfactorily between good and poor readers.[13] The Kuder-Richardson formula 20 (Kuder and Richardson, 1937) estimate of reliability for Swedish 14-year olds was 0.865; high enough to permit useful studies of individual and group correlates of the score. For further details regarding the development of this instrument see Peaker (in press), and Thorndike (1973, chapter 2). It will be noted that reading comprehension is a factor model type of variable with two hierarchical levels (compare Figure 5a).

Attitude Toward Literature (X_5) Two questionnaire items were given equal consideration as representative of the student's attitude toward literature. One was a subjective psychological attitude variable called "liking for literature".[14] The other was a more objective behavioral-type measure called "hours of reading for pleasure".[15] The behavioral measure is to be preferred for two reasons: (a) its greater objectivity, and (b) its stronger association with the other variables in the model.

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Literature Achievement (X_6) The literature achievement measure used was the one devised and pretested by the International Literature Committee chaired by Alan C. Purves. The development of the instrument and its psychometric properties take up two chapters in the monograph Literature Education in Ten Countries (Purves, 1973: chapters 2 and 4). The scores on the tests were corrected for guessing and the test reliability (K-R 20) for Sweden was 0.81. The test format was of the usual multiple choice variety, since students had to have common literary passages for analysis and interpretation. The reason for this was that a common literature curriculum exists neither within nor between most countries.[16] Like verbal ability and reading comprehension, the dependent variable literature achievement is a hierarchical factor model.

Sex Sex was used as control variable since in Sweden girls consistently outscore boys in achievement in Literature.[17]

Hours of Homework per Week Since it was thought that the amount of effort a student put into his school work might affect achievement in literature, the variable hours of homework per week was also used as a control variable.[18]

(iii) Specification of Effects

The specification problem in the development of linear, recursive models is one of ordering the variables in terms of causal priority so that the structural equations can be formulated. This matter was dealt with at some length above in the "main theory" section of the paper.[19] The operationalization of the model does not affect the chain of causation rationale. It was noted, however, that in the case of the relationship between rate and comprehension,

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and attitudes and achievement, alternative theoretical formulations existed; and in both instances the matter of the functional form of the relationship was an open question. On both issues the "popular" or conventional wisdom explanations were the one's set up for testing and presented in Model I.

Rather than repeating what is already captured mathematically in Eqs. 1 - 4 above,[20] the hypotheses built into the system of equations will be formulated verbally. The hypotheses are not an exhaustive set, but it is hoped that they reflect the causal laws governing the system of relationships among the variables.

(i) Cultural and Personality Resources Hypotheses

1. Achievement in mother tongue literature, reading comprehension, and reading rate, varies with the cultural level of the pupil's home as measured by the number of books in the home.
2. Attitudes toward mother tongue literature vary with the cultural level of the pupil's home.
3. Achievement in literature, reading, and reading rate, varies positively with the verbal ability of the pupil.
4. There will be a modest association between the cultural level of the pupil's home as measured by the surrogate variable number of books in the home, and the pupil's verbal ability.
5. More favorable attitudes toward mother tongue literature as represented by the proxy hours of reading for pleasure per week, will

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be held by pupils with the higher levels of verbal ability.

(ii) School Related Skills Hypotheses

6. Achievement in literature will be positively correlated with such school related skills as reading comprehension and reading rate.

7. Attitudes toward literature will be adversely affected by low achievement levels in reading comprehension and reading rate.

(iii) Control Variable Hypotheses

8. Girls will outscore boys of the same age on achievements in literature, reading, and reading rate.

9. Girls will tend to have more positive attitudes toward literature than boys.

10. Achievement in literature, reading comprehension, and reading rate will consist of nonmonotonic functions (possibly logarithmic in form) of the amount of effort expended on school related subjects, as measured by the number of hours the pupil spends on homework per week.

Discussion of Model I relationships has so far precluded discussion of the control variables, sex and effort. Since three control variable hypotheses are presented above some explanation is in order. First, sex. The fact that the sex differences are related to differential school achievements is well documented both in recent IEA reports and other sources.[21] The research literature is, however, long on description and short on explanation. Because the theory of sex differences is relatively underdeveloped no attempt is made here to go beyond the empirical level. The fact is that in Sweden, population II, the correlation between sex (scored 1 for boys, 2 for girls)

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and achievement in literature is 0.21. The mean cross national correlation was a little over 0.20 (Purves, 1973: 160). Thus, in the system of variables constituting Model I it was thought advisable to consider the introduction of statistical controls to avoid the possibility of the confounding influence of sex.

Similarly, it was thought that the amount of effort expended on school work as represented by the variable hours per week spent on homework might also confound the system of relationships. There was some evidence in IEA studies that the homework variable had some impact on achievement. This was referred to in the science volume where the authors note:

> . . . Hours of homework per week is a sound indicator of standards of industry and effort by students at school. ... (Comber and Keeves, 1973: 263)

Unfortunately, the effects of the homework variable on achievement in literature have not been published. In Sweden the correlation for population II is -0.12 suggestive of a nonlinear relationship.[22] In other words, 14-year olds who study at home do so because they are weak students in school. The hypothesized relationships are presented in Figure 6. Thus, low

Figure 6 about here

achievers in literature may be found among those who do a great deal of homework as well as among those who do little or none. The reason, then, that this variable failed to account independently for achievement in literature -- and hence why it was not referred to in the Purves monograph -- may be attributable to the fact that it is nonlinear and not estimateable by the IEA linear model. Since the homework factor might be a source of bias, it is taken into consideration in constructing Model II which is formulated in the findings section below.[23]

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4. FINDINGS

The findings are presented under three headings. Model I findings are examined first, and are used to revise the model further. Analysis of the revised model is followed by the presentation of the third and final model which is the basis for the subsequent interpretation of the model and its implications for educational practice.

(i) Model I Findings

The zero-order relationships between Model I variables -- including two measures of attitudes -- are presented in Table 1. Though these are interesting in their own right as summary measures, one cannot gauge the relative contribution of the several factors until a regression analysis has been conducted. For several reasons it was thought that the most parsimonious procedure would be a multivariate regression analysis using both reading comprehension and achievement in literature outcomes as dependent variables. These were regressed on six predictors. The results of this analysis are presented as Table 2.

Table 1 about here

From a multivariate procedure such as MULTIVARIANCE (Finn, 1972) one can obtain both multivariate and univariate F-ratios, which indicate the statistical significance of relationships between either (i) predictors and both outcomes taken simultaneously, or (ii) between predictors and outcomes taken one at a time. Secondly, one obtains the relative effects of the predictors from the standardized betas; and the overall predictive power of the model from the multiple R and/or R^2 coefficients. Since it is hypothesized that both criterion measures are causally dependent on the predictors, these two advantages

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of the multivariate regression procedure are particularly important.

Attention is drawn first to the mean sex differences which can be extrapolated from the mean differences presented as marginals in Table 1. For the most part they are in the predicted direction. The single exception is the similarity between both boys and girls in verbal ability scores -- though the boys are a fraction ahead of the girls the difference is trivial. Girls outscore boys in reading and perform markedly better in literature. These results are consistent with overall IEA findings.[24] Secondly, attention is drawn to the strength of the pattern of relationships between verbal ability, the cultural level of the home, reading, and literature. With the exception of a moderately high correlation between the attitude measures, the relationships among the other predictors, and between predictors and the dependent variables are either low to moderate or negligible.

Table 2 about here

It is not surprising, then, to note from Table 2 that reading speed, hours of homework, and the two attitude variables make little significant contribution to variance in either reading comprehension or achievement in literature. In the case of reading speed, when controls were placed on books in the home and verbal ability, its effect on reading effectively disappeared, despite the zero-order relationship of 0.18. Thus, the decision was made to drop this variable from the model. Further discussion of this variable is deferred until the interpretation section.

The attitude variables and the hours of homework variable deserve separate consideration. Note that despite the trivial effects of homework on both reading and literature, that the beta coefficient is negative.

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This lends support to the earlier contention (see hypothesis 10) that its effect may be nonlinear. The decision was made, therefore, to control for the effects of homework as a proxy for "effort" prior to conducting the causal analysis at the Model II stage. Attitudes 1 and 2 were entered simultaneously into the regression, making it more difficult to judge which of the two is the more effective. A standardized beta of 0.141 for attitude 1 (reading for pleasure) compared to 0.055 for attitude 2 (liking for literature) on literature achievement made the first one preferable. Since attitude 1 is a behavioral measure and, therefore, preferred on these grounds also, this variable was used in the subsequent analysis of Model II.

(ii) Model II Findings

The difference between Model I and Model II is twofold. First, in Model II the reading speed variable has been omitted from the system. Secondly, the causal relationships are not examined until after the correlation matrix has been adjusted for differences in the subgroup means between both sex and effort factors. Effort was measured by the five point variable -- hours of homework per week. It will be noted from Table 3 that even ignoring the fact that factor levels 4 and 5 of the effort variable for both boys and girls have low cell N's, the distributions are nonmonotonic.

Table 3 about here

It will be noted from Table 4 that controlling for cognitive effort tends to strengthen the relationships among system variables while reducing the size of the R^2 coefficient, or predictive value of the structural equations. Thus, in Table 4 the addition of effort as a control factor hardly affects the combined predictive effects (R^2 value) of verbal ability and

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literacy level of the home on reading ability, but it does affect their relative effects. Verbal effects are reduced somewhat while concomitantly the relative effect of the home environment factor is increased.

Table 4 about here

The findings for the predictability of reading for pleasure (ATTIT 1) from background and reading ability factors are interesting but negative. Only the relative effects of reading ability as a predictor of reading for pleasure when controlling for the confounding influence of sex and effort was significant at the 0.05 level. The explanatory power of the equation is low in that only five per cent of the variance in reading for pleasure is being accounted for, which raises the interesting question of which factors do account for the amount of time children spend reading for pleasure. In view of the relationship (r=.30) between ATTIT 1 and ATTIT 2, by adding liking for literature to the equation it might have been possible to boost predictability by an additional 9 per cent. But even this leaves 86 per cent of the variance unaccounted for. In Figure 7 the relationships in Table 4 are presented diagrammatically. The size of the residual for the ATTIT 2 equation can be noted at a glance from the figure. Clearly, in a linear model of this form the attitude variable makes no substantive contribution to explaining absolute levels of achievement in literature. For this reason the decision was taken to drop this variable in Model III analysis, though the matter raised is brought up again in the interpretation section of the paper.

Figure 7 about here

Verbal ability is a more powerful predictor of reading comprehension than achievement in literature

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according to Model II findings. In fact, the direct effects of verbal ability on literature is not significant, suggesting that the path might be deleted in a reduced form model. From Model II findings it is also noteworthy that the addition of effort as a design factor decreases the relative effect of reading comprehension on literature achievement.

(iii) Model III Findings

The sole difference between Model II and Model III is that Model III does not include an attitude variable. In accounting for absolute differences in achievement levels a measure of an individual's attitude is not an explanatory factor unless it is related to the attitudes of others in the same social context. In other words, attitudes may be situation-specific. Since the information necessary to convert an unadjusted attitude measure into a relational measure -- for example, for inputting the measure of an individual's attitude after it has been adjusted for contextual considerations -- was not available as part of the data set the variable was dropped. It will be recognized that in this form the model is misspecified, since a theoretically important variable has been omitted from the system.

Despite this shortcoming, the four variable model has powerful predictive qualities as is shown in Table 5. Two variables account for almost 40 per cent of the variance in reading performance, while three explanatory variables explain 46 per cent of the variance in literature achievement. Some indication

Table 5 about here

of the magnitude of the effects of verbal ability (word knowledge) on reading performance (p_{31} in Figure

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8) can be obtained from the path coefficient. This coefficient, $p_{31}=0.548$ is the best estimate of the net degree of change in the dependent variable (RDGCOMP) which would result from a change of one standard deviation unit in the independent variable (VERBAL). For this sample, a one standard deviation increase in verbal ability would produce a massive 54.8 per cent standard deviation increase in reading comprehension net of the simultaneous effect of the literacy level of the home (LITHOME).

There is an interpretive difficulty involved, however, in using standardized regression coefficients. The difficulty stems from the fact that standardized beta coefficients are sensitive to the standard deviation of the independent variable. Wiley (1973) expresses the difficulty as follows:

> As the variance of an independent variable decreases, the standardized regression coefficient also decreases even though the unstandardized regression coefficient (structural relation) remains unchanged.

There is some advantage, then, in describing the relationship in terms of the dependent variable metric; that is, in terms of the raw (unstandardized) beta coefficients. For this reason these are presented in Table 5 along with their standard errors. In this way, it is not only possible to interpret the raw betas; it is also possible to calculate a rough estimate of the significance of a path coefficient. If the standard error (S) of the unstandardized beta coefficient (B) is much smaller than B, the sign of the coefficient may be interpreted confidently. Further, if S is more than twice as small as B, then the path coefficient is most likely statistically significant.

Figure 8 about here

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For the p_{31} relationship in Model III diagrammed in Figure 8, an increase of one point in verbal ability increases the reading comprehension score by 0.63 points. Similarly, an increase of one in the raw metric (number of books in the home) of the LITHOME variable, increases the reading comprehension score by 3.44 points.

In some ways of much greater interest is the finding that verbal ability affects achievement in literature less in a direct manner than indirectly via reading comprehension as a mediating variable. The direct effects (p_{41}=0.090) are not significant at the .05 level, whereas the total indirect effect (TIE) of X_1 on X_4 = $r_{41} - p_{41}$ = 0.34, which is considerable.

The variable LITHOME which is a proxy for the general cultural level of the pupil's home operates both directly and indirectly on literature performance. Thus, net of other variables in the system, an increase in the raw metric of the LITHOME variable accounts for an increase in the pupil's test performance in literature of two points. And by the same token, an increase of one point in the score in reading comprehension is accompanied by an increase in achievement in literature of 0.40 points.

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5. DISCUSSION

(i) Theoretical Implications

1. Reading rate. The results of the multivariate regression analysis presented in Table 2 show convincingly that reading rate has no tangible effect on either reading comprehension or literature. Similarly, the zero-order relationship between reading rate and literacy level of the home was trivial. In short, there was little support for the popular belief that comprehension is dependent on rate. Neither was there support for the notion that rate is a function of verbal ability. One possible explanation of this has been posited above; namely, that the relationship between rate and comprehension is a complex one, mediated by a number of conditioning variables which interact with rate as a concomitant variable.[26] Another reason why rate had no relationship to comprehension for the population tested may have been because the test for rate had a different purpose, and consisted of a different type of reading material than the test for reading comprehension.

Thus, the reading comprehension test may have had its own reading rate built into it, which was analytically distinct but not empirically separable from the test measure itself; and this component of the reading test (being of a different logical order in terms of purpose and material than the reading rate test) was neither congruent with, nor covaried with, the rate test. If this were the case, then it would follow that a valid rate measure for any comprehension test must be based on a passage (or passages) being read for the same purpose and composed of the same kind of reading material. But since a comprehension test includes rate as one of its inextricable components (the word "test", by definition, presupposes some time limit) it seems fatuous to include it in models where

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interest centers primarily on reading comprehension.

2. Attitude toward Literature. The finding that neither attitudes toward literature, nor the time spent reading for pleasure, accounted for variability in literature achievement was disappointing. In the case of attitudes toward literature the explanation may be attributable to the kind of model misspecification due to the use of an incorrect functional form. This complex matter is taken up below. The explanation for the failure of the variable hours spent reading for pleasure is probably simpler. Two overlapping explanations are suggested.

First, literature is unlike some other school subjects such as mathematics and science, which make little or no sense unless the student is already on the inside of their content and logical form. In the case of literature, a relatively naive student can read a literary work because it is in the common language and find something of interest, even though literary understanding may be at a low level. But unless the student is assisted in the development of his critical powers; and unless he has his attention consciously drawn to the durable qualities in a literary work, his appreciation may remain relatively undeveloped despite considerable time spent reading literature. Secondly, it depends what the pupil reads. No matter what potential the pupil has, reading for pleasure is unlikely to have positive effects unless that reading is of literary merit. Just as the child who interacts almost exclusively with age-peers with parallel vocabulary levels to his own is unlikely to extend his vocabulary or significantly improve his language usage, so the pupil who reads exclusively "low-level" literature, or one kind of literature only, is unlikely to significantly develop his literary tastes or his critical capacity.

The absence of impact of the variable ATTIT 1,

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hours of reading for pleasure, may be attributed to the failure to incorporate a component such as type of reading in the variable itself. The remaining aspect -- opportunity to learn about the principles governing the aesthetics of literature -- may or may not be variable in that in Sweden age peers of both sexes are taught by State certificated teachers, are exposed for about the same length of time each year to the formal literature curriculum, and taught in non-grouped classrooms. Thus, opportunity to learn may be a constant factor. Variance attributable to differential rates of school attendance, classroom disruptions due to disorderly pupil conduct, and non-purposeful classroom activities, was not measured by IEA surveys, and, therefore, could not be considered.

The failure of the functional form of the model to capture variability in literature attributable to attitudes toward literature, may be twofold. First, a model of absolute achievement in literature for 14-year old Swedish pupils may be inadequate because the attitude formation context is not the entire country but, rather, the school; and within the school, classrooms. If attitudes toward literature are context-specific, as is suspected, then it is unlikely that the linear model containing "natural" or unadjusted attitude and achievement outcome variables would capture attitudinal effects. Such a model is described below in Eq. 5. In the most general case the value of the vector for the jth pupil in the ith school is denoted by $\underline{X}_{ij}$. The unadjusted effects of individual characteristics (denoted by $\underline{\beta}$) on the outcome (denoted by Y_{ij}) is captured by the equation:

$$Y_{ij} = A_0 + \underline{\beta}'\underline{X}_{ij} + E_{ij} \qquad (5)$$

where: Y_{ij} = the outcome measure; e.g., achievement in literature

A_0 = the regression constant

$\underline{X}_{ij}$ = the predictor variables, X_1, X_2, ..., X_n in the model; and

E_{ij} = the residual or disturbance term.

A reason for the failure of Eq. 5 may be due to the fact that attitudes are governed by the school and classroom context. For example, a pupil of high ability in literature in a high ability school or class may have only a modest ordinal performance relative to the members of his reference group in the school. Similarly, a pupil with a modest absolute level of performance may have a relatively high ordinal performance, if he attends a relatively low achieving school. Such a phenomenon may account for a high performing pupil (in an absolute sense) having a low liking for literature, and a modestly performing pupil (absolutely) having a high liking for literature, if performance reciprocally interacts with attitudes (as in Figure 4). What is posited here is the notion of a psychological disposition (ATTIT 2) which has sociogenic properties, such that the disposition which is reflected in an indicator at a particular time may have arisen in part as a consequence of the very activity it tends to instigate. On the same logical point see Duncan and Featherman (1972: 130-134).

For the attitudes of such pupils to have effects on literature outcomes, both the attitude variable and its associated outcome measure of achievement have to be adjusted inorder that the pupil's definition of the situation can be considered. Such an adjustment is demonstrated by Eq. 6 in which an attempt has been made to compensate for the biased estimate of the standardized beta (β_z) in the attitude case. In this model the attitude variable is labelled Z and the emphasis

is not on the absolute level of individual pupil achievement but on relative achievement. The purpose of the model is to account for the difference in performance between the individual pupil and his peers.

$$Y_{ij} - \bar{Y}_{i.} = A_0 + \underline{B}'\underline{X}_{ij} + B_z(Z_{ij} - \bar{Z}_{i.}) + E_{ij} \quad (6)$$

where: $\bar{Y}_{i.}$ is the mean of the Y_{ij} for the $\underline{i}$th school; and

$\bar{Z}_{i.}$ is the mean of the attitude (Z_{ij}) for the $\underline{i}$th school.

If it is wished to adjust for all sources of school-related variation, the simplest model is one in which all individual-level variables are adjusted for the possibility of school bias as in Eq. 7.

$$Y_{ij} - \bar{Y}_{i.} = A_0 + \underline{B}'(\underline{X}_i - \bar{\underline{X}}_{i.}) + E_{ij} \quad (7)$$

The models represented by Eqs. 6 and 7 were not tested, though the nationally representative school samples available in the IEA data bank archive would accommodate such tests.

3. Resource Conversion Considerations. It was shown that both sex and effort were confounding factors; and demonstrated that the procedure of pooling the within-groups measures (design factors) was a viable way of coping with the problem. An unanticipated finding stemming from the use of this technique was that the adjustment for effort resulted in a strengthening of the environment variables. Thus, in the presence of the control for effort the relative effects (standardized betas) of verbal ability on reading comprehension declined and that for the literacy level of the home increased. Similarly, Table 4 shows

that in the presence of adjustment for effort, the strength of the reading comprehension variable on literature achievement declines. This is interpreted in terms of effort compensating for inherent abilities and skills. In other words, empirical support for the principle of compensatory education, since up to certain unknown thresholds the efforts made by pupils will assist in the marshalling of resource assets (enhancing environmental factors) to compensate for resource deficits (personal abilities and skills) inorder to transform or convert the personality attributes into resource assets.

4. Effects of Verbal Ability. It was shown (e.g., Model III) that the effect of verbal ability (word knowledge) on reading performance was substantial. The magnitude of the path coefficient (p_{31}) in Figure 8 is simply an estimate of the net degree of change in the dependent variable (RDGCOMP) which would result from a change of one standard deviation unit in the independent variable (VERBAL). For this example a one standard deviation increase in verbal ability would produce a 54.8 per cent standard deviation increase in reading comprehension net of the simultaneous effect of the literacy level of the home (LITHOME). Surprisingly, VERBAL had only a slight (nonsignificant) effect on LITACH which implies that its effect on literature was an indirect one mediated by reading comprehension. The practical implications of this finding are taken up below.

5. Effects of LITHOME. The weakest conceptual variable in the model was undoubtedly LITHOME, the literacy level of the pupil's home, as measured by the number of books in the home. The number of books, however, says nothing about their type, whether they are for display or use, the extent to which family

members critically discuss the merits of selected volumes, whether the collection includes children's books, and so on. Thus, the variable appears to be a weak proxy for a set of qualities of the home environment, and attitudes of family members related to learning, reading, and scholarship. As such the presence of a home library is indicative of the literary tradition of the pupil's household and, in particular, of the extent to which school related activities of a verbal kind are replicable in the home; and, hence, the degree of congruence between the home and the school.

Further, the variable, books in the home, as measured, probably underestimates the influence of the home's literacy level as a determinant of achievement in both reading and literature. The proportion of the responses to the five categories of this variable by the entire Swedish population II sample was as follows:

Q. "About how many books are there in your home?" (Do not count newspapers or magazines). Choose one.

Response Categories	Percent Response Swedish 14-year olds
A. None	0.9
B. 1 - 10 books	2.0
C. 11 - 25 books	7.0
D. 26 - 50 books	18.3
E. 51 or more books	71.8

The distribution indicates clearly that the response categories do not differentiate well between the size of home libraries in Sweden. Neither do the categories differentiate the size of home libraries in developing nations as Thorndike (1973) points out,

though in these instances the skewness is the reverse of that for Sweden. For this reason, the overall correlation of 0.27 for the entire data set, or 0.26 for the subsample used in this study, between size of home library and reading comprehension should be regarded as remarkably high. In any case, the effects of the LITHOME variable on both reading and literature are probably underestimated.

This conclusion underscores the relative crudity of survey-type questionnaire data for getting at the fine-grain effects of interpersonal environments and social processes on school outcomes of policy interest. Thus, in large-scale omnibus studies of the survey variety in which data is gathered for examining a variety of theoretical issues and practical questions, the effects of process factors or social environments may be masked because of the varying strengths and direction of the environments studied. Nevertheless, such research does permit systematic comparison of schooling processes despite the kind of measurement problems referred to above (cf. Bidwell, 1972: 5-6). Neither should the fact be overlooked that in the early stages of any kind of research work, methodological issues are inevitably going to take a dominant role in the discussion of substantive questions (cf. Coleman, 1973: 2ff.). Thus, the question is not one of either "macro-survey" research of comparative social systems, or "micro-ethnographic" studies of single cases (whether the school, the school class, or the classroom) but rather insistance upon the complementarity and necessity of both types of research endeavour. As survey models become more refined, the complementarity referred to will become increasingly obvious.

(ii) Practical Implications

1. Preliminaries. Four preliminary matters will be taken up prior to a presentation of some practical implications of the research. There are several pitfalls not easily avoided in making practical inferences on the basis of empirical enquiries such as this. First, one has to cross disciplinary boundaries which are logically distinct in kind -- from the descriptive procedures of the social sciences, to the prescriptive domain of the practical activity of education, or in the limiting case, ethics.[27] Secondly, in making practical judgments about any activity there are usually equally, or more important inferences that can be made about the issues in question, to be drawn from other disciplinary areas. In the case of education, in addition to sociological and psychological considerations there are minimally the economic, historical, philosophical, and ethical. But in the case of the education of minority group or ethnic group children, the cultural anthropologist may play an important role in the decision-making process; and in the case of curriculum matters the logical considerations stemming from the nature of the type of inquiry or discipline itself must necessarily play a decisive role. For these reasons the practical inferences to be drawn from, say, sociological-type inquiry may be one-sided. It is important, then, to balance these inferences against those from other sources. And, of course, logical considerations must necessarily supercede the psychological in such discourse. Perhaps in this way the bane of the social scientist -- the naturalistic fallacy -- can be avoided.

A second comment concerns the earlier claim that research of this kind is less likely to suggest radical changes in school practices, than to provide the educator with evidence for discarding or deemphasizing practices which have little or no impact on the

desired outcomes of schooling. This prediction is borne out by this study, since the practical implications tend to refer to practices which in Sweden, as elsewhere, are currently in force. In other words, the study provides support for the current efforts of mother tongue literature teachers, and suggests which efforts may be the most effective.

Thirdly, the reader will have noted that the Model III variables are potentially policy manipulable by teachers at the classroom level. This is in marked contrast to the findings of many studies where key variables include background factors such as parents' education, the prestige of the father's occupation, IQ, and type of school which may account for powerful effects on scholastic performance, but which are well outside the sphere of teacher, or even school, influence. The variables in this study in contrast are all more or less policy manipulable by school authorities. Thus, the teacher can control the amount and type of homework; can select literature which is appealing to boys on the one hand and girls on the other; can influence the pupil's word knowledge and reading comprehension performances through classroom activities; and can act as advisor on book purchases, and therefore influence the pupil's ownership of books in his home library.

This suggests, fourthly, that ubiquitous social Darwinist dogmas which continue to constrain school practices are false doctrines; that teachers can exert powerful morally desirable influences over the scholastic performance of pupils; and that, therefore, mother tongue teachers can and must individually and collectively assume responsibility for the intellectual performances of pupils from all social groups no matter how different their attributes. The presentation of the following practical implications of the research

is predicated on the assumption that teachers have within their control the means for initiating the student into the main modes of understanding characteristic of the cultural tradition of their society -- including the society of scholars -- and that this control is no less possible for mother tongue literature teachers than for more school-specific subjects.

2. The Sex and Effort Factors. One type of specification error occurs when subgroups of respondents within the data set have different means on one or more variables which are correlated with achievement and outcomes, when these differences are ignored or unused for making necessary adjustments to the structural equations. In the case of the present data set there was sufficient evidence from earlier IEA analyses that sex differences affected achievement in outcomes on verbal performances, and that the amount of effort as reflected in the amount of school work performed at home also accounted for variation in school related achievements, that these two potentially confounding factors could be taken into consideration and controlled for by making appropriate statistical adjustments to the data prior to the regression analysis. The point can be illustrated by reference to a hypothetical example.

Suppose that: (1) prior performance on some school related achievement outcome; (2) differences between the performances of boys and girls; (3) differences between those who practiced their school related activities at home, and those who did not practice at home; and (4) the differences between those pupils whose teachers held themselves responsible for how well their students performed and those teachers who held themselves less responsible, were the only factors that affected the final achievement of pupils. In this model the

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correct mathematical equation would be:

Final achievement (Y) = prior performance (U) + sex (V) + practice at home (W) + teacher responsibility (X) (8)

In this instance, a model (Eq. 9) with, say, practice at home (W) missing, would be misspecified -- that is, would be an oversimplification of "reality" -- because it would produce a biased estimate of teacher responsibility unless practice at home were perfectly correlated with sex and prior performance.

Final achievement (Y) = prior performance (U) + sex (V) + teacher responsibility (X) (9)

This second model is misspecified because the estimated effect of teacher responsibility (X) would equal the actual effect of teacher responsibility plus part of the effect of practice at home (W). In other words, Eq.9 would give teacher responsibility credit for part of the effect due to practice at home. The error consists of the bias introduced as a consequence of the failure to specify practice at home in the second equation. One way of handling such bias is by a linear control on (W) within the general regression model prior to examining the impact of the remaining effect parameters (U, V, and X). Another way is by adjusting the error correlation matrix for within group mean differences on the (W) factor through the use of a pooling procedure described by Finn (1974), and available in the muti-variance statistical package used in the data analysis stage of this study (Finn, 1972).

The latter procedure was used in the study to remove bias introduced by both sex and effort (practice

at home). On the basis of the findings (Tables 3 and 4), it can be confidently asserted that both variables made a difference. The obvious implication for practice of the finding related to sex differences is that both 14-year old boys and girls might benefit in terms of literary understanding from exposure to different content curriculums. Such curricular differences would be based upon the different literary interests of the sex groups.

The principles of literary criticism -- that is, the procedural principles invoked in making judgments related to the aesthetic appreciation of literary forms - are analytically distinct from the content of the form. Thus, it is logically possible to initiate the pupil into the procedures of literary criticism and appreciation via an almost infinite number of meritorious works in a variety of forms -- for example, poetry, stage drama, cine-drama, the literary essay, literary criticism, the short story, the novel, and the modern folk song. Furthermore, there is no logically necessary starting point or conclusion, since "education" is hardly characterized by the sheer distance travelled but by the manner and style of the journey. This is because an education sheds light on many other things including previously darkened surfaces, thus making the journey more interesting and worthwhile.

There may be, however, psychological constraints, if not logical ones on the content of the literature curriculum. The Piagetian orders of conceptual complexity will necessarily dictate an epistemological order of understanding, in which the pupil's cognitive maturity or level of thinking will ineluctably narrow the range of possibilities. Such constraints will be as fundamental in their importance for common language pursuits, such as literary understanding, as is the

case with more school-specific subjects such as science and mathematics. It is probably pedagogically sound to claim, then, that the procedural principles themselves are independent of any particular literary form. That is, there is nothing sacrosanct in terms of understanding the aesthetics of literature, or getting on the inside of the procedures of literary criticism, about lyric poetry, or the Victorian novel, or Shakespearean drama, or mother tongue literature sanctified by tradition. Gaps in content are of less significance than gaps in understanding of the logic of the mode of inquiry in question.

If 14-year old boys prefer modern adventure stories, epic poetry, and "popular" scientific essays to romantic novels,Shakespearean sonnets, and literary essays, there is no inherent reason why the competent teacher cannot structure a curriculum which initiates the pupil into the mode of literary understanding which is based upon these preferences. This might be an extreme example since in practice both pupils and teachers are likely to make compromises -- especially when the teacher has gained pupil trust. On the other hand, the teacher in some situations may have to break down a longstanding tradition of disregard and disinterest in literature, or apathy and indifference toward learning how to read. In such cases it may be necessary to begin teaching aesthetic understanding by appealing to nonverbal expressions in the popular culture of interest to students. Consider, for example, the teaching of the aesthetics of basketball, or the aesthetics of the folk song (modern ballads), in which the forms -- "movement" and music -- are different, but the procedural principles of aesthetic appreciation essentially undistorted. In short, there is no necessary compromise over the manner -- that is, understanding the form -- only over the matter, which need not be the same for pupils of different cultural backgrounds, different interests, or different sex.

By the same token, just as effective literary instruction toward the goal of understanding literature is independent of content, so it is independent of any fixed starting point, though perhaps having started, say, with the TV cowboy movie, it may be vital to one's purpose to carry on systematically to compare TV and cinema versions; to compare TV drama and Stage drama; modern drama and the modern novel, and so on. There would appear to be no inherent reason why the principles of literary appreciation conveyed by such content should differ from those taught via more traditional works.

While it is relatively easy to recommend the consideration of different literary curricula for boys and girls based upon sex differences, it is less simple to translate into practical terms the findings related to effort; that is, the amount of homework. Two conclusions were drawn from Table 3. First, homework does make a difference. Second, the relationship of time spent to productivity (achievement in both reading and literature) was curvilinear, such that those pupils who spent a lot of time did no better than those who spent little or no time.

Though one might correctly infer that the reason for this relationship is that the length of homework is proportional to its need, there are still unresolved questions such as: What is the optimum homework time per pupil? How valuable is persistence and perseverence? What characteristics of the home environment facilitate the replication of school environments in the home?

It is believed that children benefit scholastically from doing moderate amounts of homework per week in all subjects; where moderate may be interpreted at the 14-year old level to mean from one half hour to an hour per day. Further, that children who do little or no homework are likely penalizing themselves

in terms of their future performances, while those who do a great deal are unlikely to receive proportial payoffs.

Though recommendations regarding homework are largely contingent upon further research it can be confidently asserted that the current evidence supports the desirability of pupils being able to practice school related activities at home. Thus, there is some support for the provision of a home opportunity structure which replicates to some extent those activities characteristic of the classroom. In the absence of a degree of congruence between home and school environments, in the writer's opinion it is up to the teachers to collectively take the initiative. The time parameters of the school are manipulable and so is the curriculum content. Both can be modified without jeopardizing the principles of educational practice. With regard to homework three inferences are drawn:

(1) homework practice might replicate in the home educational activities performed in school;

(2) only activities which are realistically replicable in the homes of the pupils might be given;

(3) homework activities should be moderately demanding in terms of both time and effort.

The recommendations are based on the premise that if school environments are not replicable in the pupils' homes the onus is upon the school to change.

3. The LITHOME Factor. The measurement problems and limitations of the LITHOME variable were discussed above.[28] What it is important to note for the purposes of making practical inferences is that LITHOME or the concept, literacy level of the home, is a proxy for family background structures. How well a pupil performs in literature at a particular grade level depends on

several proximate factors, but overridingly on the pupil's performance prior to entering the grade. In the words of Gilbert Peaker: "What one can do today depends on what one did yesterday. But equally, what one could do yesterday depends on what one did the day before." In accounting for present performance in literary understanding, the analyst wants to know as accurately as possible what proportion of the variation in present performance is attributable to recent learning conditions and experiences, and what proportion is attributable to early conditions and experiences.

This is an unsolvable problem with cross-sectional data because the estimates for the earlier influences have necessarily to be best estimates -- some would say, best guesses. Since nearly all research in this problem area has been conditioned by the Coleman studies of equality of educational opportunity in the United States, and by the Peaker studies of the Plowden children in the United Kingdom, it is not surprising that most analysts have followed their lead by using a set of family background variables as the best proxies or surrogates for these early learning experiences. The conventional wisdom is supportative of the view that early learning experiences are likely to be more powerful influences in accounting for current performances than the more recent ones, which is precisely what Coleman and Peaker found in their studies. Unfortunately, there has been a steady refusal on the part of some researchers to recognize the gap between the language of theory and the language of research, with the result that the proxies used to account for earlier learning experiences have been interpreted rather literally to mean that the home is a more powerful influence on scholastic performance than the school. In recent empirical studies both analysts have expressed their disagreement with such views (Coleman, 1973; Peaker, n.d.).

This misunderstanding has been compounded by the invidious comparisons that have been made between the effects of recent learning conditions attibutable to within school factors and proximate teacher behavicurs on the one hand, and the much greater effects that are attributable to the earlier learning conditions for which background factors and personality characteristics are proxies on the other. Thus, questions such as: do teachers make a difference? or, how effective is schooling? have been posed in recent years suggesting that teacher effects and school effects are less powerful influences than popular myth structures would have us believe.

The conclusion this author draws from these studies is that the schools are quite uniform in their impact; so much so that despite the manipulation of within school, or within class environments, the relative position of pupils viz-a-viz one another on measures of scholastic performance at the end of some period of instruction is likely to be roughly the same as it was at the beginning. Hence, the likelihood that despite an overall mean gain in performance for all pupils during the period in question, an individual's rank in relation to his peers at the time of final testing is likely to be practically the same as what it was at the beginning. However, there is no "time-one" in cross-sectional studies, only the background proxies for prior learning conditions and experiences; hence, the "high" correlations between present performance and background variables.

These insights provide the interpretive key to the LITHOME variable. The number of books in the home does not <u>really</u> matter. For example, one could provide some children with the resources of the British Museum, or the New York Public Library, and it would

make little difference in their achievement in mother tongue literature unless these resources were accompanied by the changes in attitudes and abilities associated with the presence of home libraries. This is largely, but not entirely, because the number of books in the home is an indicator of the kind of earlier learning conditions experienced by the pupil. It is an indicator in the same way that the number of church candles purchased by Catholic families in Paris at the turn of the last century was used by LeBon, the French sociologist, as an indicator of religious devotion; or, in the same way that the proportion of males in the agricultural work force has been used as an index of modernization.

Since the number of books in the home as an index of early learning influences has an impact on both reading and literature achievements, it is desirable for mother tongue teachers to continue, and even renew, their current efforts in encouraging children to utilize public libraries, school libraries, classroom libraries and the like. Though for elementary school children it is especially desirable to discontinue practices which discourage children from borrowing books and utilizing library facilities, such as fines for overdue books, inconvenient library hours, and drab, cheerless library rooms; it is sometimes difficult to reconcile these with the equally desirable requirements for pupil decorum and the necessity for respecting the reading rights of other pupils. Perhaps the most positive approach for younger pupils in the first division of the school grading system (grades Kindergarten through three) is to provide more families with access to community resources for stimulating the complex environments that characterize those homes with high achieving children. The dimensions of these cognitive, conative and affective home environments were almost unknown a few years ago, but recent work by such

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social learning theorists as Williams (1974) is proving particularly helpful in this regard.

In the earliest grades the term library may be a misnomer. In order to provide the complex stimuli desirable for the development of cognitive abilities a new institutional setting may be desirable where the equivalent of a "library" or book corner might include toys, games, and puzzles. In the division two and later grades libraries might become distribution centers for cheap, attractive, children's pocket books on the assumption that ownership makes a difference in the meanings that books have for children. Teachers might consider concerted action favoring the elimination of sales and/or purchase taxes on books and other children's educational materials. Teacher groups might also consider the possibility of supporting laws for the removal of excise duties on books where such duties are imposed. There are several countries where book ownership is so expensive as to be almost a prohibitive luxory for the lower or middle income family.

All efforts designed to place more of these educational resources in the children's homes, thereby replicating the school's learning environment more faithfully in the home, seem one way of ensuring that educational attainment level of the entire society is raised. Further suggestions for action in these matters are contained in the recent UNESCO publication, Books for All (n.d.).

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These suggestions for increasing the congruence of home and school environments are not particularly supportative of the home interventionist philosophy, whereby the school authorities interact on a more or less sustained basis with parents. Rather, the suggestions are designed to promote opportunities for the pupil to take greater responsibility for his own learning; to sensitize children to the expectations and demands of adults; to provide encouragement and support supplementary to that given by the home. In this way the school authorities are supportative of, not interventionist in, the family institution. The chief justification of this approach is that a purpose of schooling is to provide authority structures which will enable the child to become independent of authority -- so that the intellectual gap between student and teacher is progressively bridged. Such a purpose demands that pupils become progressively less dependent on teachers.

4. VERBAL and RDGCOMP Variables. Several practical considerations stem from the findings that verbal ability and reading comprehension have extremely powerful effects on achievement in literature. Though it is obvious that inorder to understand literature one has to be able to read -- and read well -- it is still valuable to obtain accurate estimates of the extent and power of the dependence for different age groups. It is held that the basic model of literature achievement as described in this study has to be extended, and some suggestions for model respecification have been made. It is also held that the research has to be replicated on a larger scale by the various national centers inorder to validate the findings cross-nationally. Nevertheless, it is confidently believed

that the basic model as presented is conceptually correct; and that therefore the practical implications have to be faced by curriculum theorists.

Consider the following.

1. Because a high degree of association is noted between two or more variables does not necessarily imply that the manipulation of one will have effects on the others. Perhaps the most important requirement as far as future research is concerned is the experimental testing of the efficacy of the development of word knowledge and reading comprehension skills to be able to evaluate more accurately their effects on literature achievement.

2. If it is desirable to change prevailing practices inorder to achieve some desirable outcome, some estimate of the degree of societal effort required to implement the change is minimally necessary. This is because the extent to which change is possible is determined by the costs in effort involved. The changes necessary to reemphasize word knowledge skills and reading comprehension at the 14-year old age level are probably minimal. The manpower required to initiate change -- mother tongue teachers --constitute a highly educated and dedicated corps of teachers capable of developing and implementing a range of appropriate teaching strategies.

3. The direct effect of verbal ability on reading comprehension and its indirect effect via reading on literature suggests an increased emphasis on word building skills in the secondary school as well as at more elementary levels. Approaches would vary at different grade and ability levels, but the present evidence points to considerable payoffs in literature understanding for systemmatic perseverence in the promotion of verbal abilities

4. Consider at the senior grade levels the introduction of courses in common language (linguistic) analysis inorder to provide more senior students prior to school graduation with some sensitivity to the problems of conceptual analysis.

5. Consider at the lower secondary school levels the introduction of regular instruction designed to strengthen the vocabularies of students. In this regard, and bearing in mind the interests and attitudes of pupils, consider the introduction of word games and word puzzles, along with opportunities for students to exercise verbal skills in settings less artificial than the classroom; for example, the deserted stage, the empty pulpit, the TV or radio studio, the debating chamber, and the like.

6. The role model for the mother tongue teacher -- for many, the university scholar -- need not be the most appropriate model for the literature teacher who has a less specialized role to perform. Literature teachers have to be teachers of reading skills also, though at the senior school grades may be lacking suitable preparation. Thus,despite the tendency for university-type curricula to filter down into the school grades there may be still advantages as far as gains in literature are concerned in teaching such skills as: the paraphrase, the précis, the abstract, and the report.

7. Consider the value of providing the resources in teacher training institutions for the training of teachers of developmental reading at the secondary school level.

8. Consider the teaching of media skills which demand the active verbal participation of pupils; for example, script writing for the TV drama and the documentary movie, radio announcing, class newspaper production and the like.

6. CONCLUSIONS

1. The use of linear causal model building procedures is likely to become more common in curriculum research. Three stages in the model building process were illustrated in this research: (1) A conceptual stage at a high level of abstraction in which the major effect parameters are described, and the most important contrasts between effects delineated. At this stage some fundamental model building principles were presented which may be used to guide model development. (2) The main theory building stage is concerned with the more detailed presentation of the fully specified conceptual model. The network of causal relationships is described and the causal flow justified by reference to the theoretical literature. (3) In the auxiliary theory stage the fully specified conceptual model is operationalized and the research hypotheses generated from the main theory propositions. It is at this stage that the data is described in detail.

The development of causal models and the formulation of causal model building principles and strategies is of more recent origin in North America and Western Europe than in the Soviet Union and Eastern Europe though some exceptions to this generalization may exist(e.g., Ogburn's early work in multiple regression models). In these latter countries the formulation of predictive and/or explanatory models of social behavior -- especially economic behavior -- was stimulated by the writings of Lenin and his emphasis on economic planning implemented by the first series of plans in the 1920's. The research, indispensible to the preparation of a scientific base for economic planning, became known later as social-economic prognostication. Especially in the English-speaking countries, the equivalent research would be largely of the prediction model

variety. In the Soviet Union as in the United States, economic prognostication or economic growth modeling is more advanced methodologically than in other socio-economic disciplines, and the application of such research in the economic planning sphere more common than in such areas as health systems, public education and aspects of urbanization (Bestuzhev-Lada, 1969: 302).

Though the purpose of the present research has been explanatory, not predictive, the logic of the analysis is essentially the same as that of the social-economic prognostication models used in the USSR. There are probably two major differences between the otherwise quite compatible research procedures. Though in both systems the taxonomy or initial conceptual framework is nonempirical (in our case the resource input framework), consisting of untestable ideologies, the ideologies are divergent in fundamental ways. Thus, macro-models may be more likely to play more prominent roles in Soviet-style predictive systems, and micro-models in American-style models. Secondly, computer software packages seem to be more accessible to US researchers in the social sciences other than economics, than to their Russian counterparts. Perhaps, surprisingly, the problems currently under examination tend to be very similar.

2. Only hypotheses 4, 8, and 9 (out of ten) remained unscathed as a result of the analysis. This is because the reading rate and literature attitude variables played some role in all the remaining hypothesized relationships. The reasons for the lack of support for the popular misconceptions about reading rate and reading comprehension were presented above (section 5, i, 1). Clearly, rates vary according to the reading purpose and the type of material; and unless these

components are considered, an arbitrary measure of reading speed as used in Model I is probably meaningless. Thus, speed is an integral subcomponent of comprehension and fluency.

The decision to remove the variable from the causal system was justified on these grounds. In this way it was shown that the new myth that speed improves comprehension is as unacceptable as the old one that slow, careful readers were the best readers. Both myths may or may not be correct, of course, depending upon the reading purpose, type of material, and possibly other factors. Teachers encouraging careful, close reading of a passage, or fast reading, ought to be cognizant of the fact that the rate to be attained depends minimally on these two conditions.

There is a simple solution as far as theory modification is concerned. Since reading rate is already built into the reading comprehension variable, all reference to it in the specification of effects (4, iii) should be dropped. Model I was, therefore, misspecified because the variable reading speed had mistakenly been included in the model.

The modifications to the theoretical model in terms of specifying the form of the effect parameters in so far as attitudes to literature are concerned is largely dependent on future research. On the basis of current findings, it is believed that the model is missecified because an absolute measure of attitude to literature ignores the possibility that attitudes may be characteristically situation-specific. The extent to which this hypothesized possibility is correct is unknown at the moment, but the models represented by Eqs. 6 and 7 (both testable with data already in the IEA data archive) are respecifications of the functional form of the model to counter the possible error.

3. In addition to further research which incorporates the functional forms represented by Eqs. 6 and 7, there are additional possibilities. One of these involves adding further variables to the data set. Consider, for example, a variable such as "level of thinking" in the Piagetian sense, which might be incorporated prior to attitude, but following reading comprehension in Model II. Work presently underway in the Institute for the Study of International Problems in Education, University of Stockholm, by Kurt Bergling, has resulted in the Guttman scale construction of such a measure from variables in the IEA data set. Then the model would help determine the relative effects of environmental factors on mental development as well as the dependence of scholastic performances of various kinds at different age levels on the stage of thinking achieved.

A second research possibility is the one mentioned earlier (section 5, i, 2, and footnote 9) regarding the existence of reciprocal effects between attitudes and scholastic performance. Yet a third possibility is the formulation of a model which would examine the relative dependence of more than one achievement criteria on the cultural and personality resources of individuals; for example, one in which the relative effects of, say, Model II predictors in Eq. 6 form were compared for two achievement outcomes -- one school-specific, say, science achievement; one less so, say, achievement in literature -- as in Eq. 10.

$$\underline{Y}_{ij} - \overline{\underline{Y}}_{i.} = A_o + \underline{\beta}'\underline{X}_{ij} + \beta_z(Z_{ij} - \overline{Z}_{i.}) + E_{ij} \qquad (10)$$

Eq. 10 would identify the degree of school specificity of science in relation to literature.

REFERENCES

Bestuzhev-Lada, I.V.
1969 Social Prognostics Research in the Soviet Union. Pp. 299-306 in, Mankind 2000. Edited by R. Jungk and J.Galtung. London: Allen & Unwin.

Bidwell, C.E.
1972 Schooling and Socialization for Moral Commitment. Interchange 3, 4: 1-27.

Blalock, H.M. Jr.
1964 Causal Inferences in Nonexperimental Research. Chapel Hill, N.C.: University of North Carolina.
1968 The Measurement Problem: A Gap between the Languages of Theory and Research. Pp. 5-27 in, Mehodology in Social Research. Edited by H.M.Blalock, Jr., and A.B. Blalock. New York: McGraw-Hill.
1971 Causal Models in the Social Sciences. Chicago: Aldine.

Blalock, H.M. Jr., and Blalock, A.B. (eds.)
1968 Methodology in Social Research. New York: McGraw-Hill.

Blau, P., and Duncan, O.D.
1967 The American Occupational Structure. New York: Wiley.

Blau, P. and Moore, J.W.
1970 Sociology. In, A Reader's Guide to the Social Sciences, Rev. Edn. Edited by B.F. Hozelitz. New York: Free Press.

Blommers, P.J., and Lindquist, E.F.
1944 Rate of Comprehension of Reading: Its Measurement and Relationship to Comprehension. Journal of Educational Psychology, XXXV, 449-473.

Bloom, B.S.
1969 Cross-National Study of Educational Attainment: Stage 1 of the IEA Investigation in Six Subject Areas. Washington, D.C.: Department of Health, Education and Welfare, Office of Education, Bureau of Research, Final Report, Project No. 6-2527, Grant No. HEW-OEG-3-6-062527-2226.

Borgatta, E.F., and Bohrnstedt, G.W. (eds.)
1969 Sociological Methodology 1969. San F ansisco: Jossey Bass.

Bore
15

Bore

Boocock, S.S.

1972 An Introduction to the Sociology of Learning. Boston: Houghton Mifflin.

Boudon, R.

1965 A Method of Linear Causal Analysis: Dependence Analysis. American Sociological Review, 30 (June): 365-374.

Bulcock, J.W.

1972 Toward a Test of the Bernstein Hypothesis: The Language Factor and Educational Achievement. Atlantic Educational Research Council Procedings.

Carroll, J.B.

n.d. French as a Foreign Language in Seven Countries. Stockholm: Almqvist & Wiksell.

Cattell, R.B.

1963 Theory of Fluid and Crystallized Intelligence: A Critical Experiment. Journal of Educational Psychology, 54: 1-22.

Charner, I., and Cohen, M.

1973 Instant Path Analysis Revisited: New Ingredients for an Old Recipe. American Educational Research Association Division Generator, 3 (May): 10-14.

Coleman, J.S.

1973 The Effects of School on Learning: The IEA Findings. Paper presented at the Conference on Educational Achievement, Harvard University (November). Mimeo'd IEA, University of Stockholm, Sweden.

Comber, L.C., and Keeves, J.P.
1973 Science Education in Nineteen Countries. Stockholm: Almqvist & Wiksell.

Duncan, O.D.
1966 Path Analysis: Sociological Examples. American Journal of Sociology, 72 (July), 1-16.

Duncan, O.D., Featherman, D.L., and Duncan, B.
1968 Socioeconomic Background and Occupational Achievement: Extensions of a Basic Model. Washington, D.C.: US Office of Education, Bureau of Research, Final Report, Project No. 5-0074 (EO-191), Contract No. OE-5-85-072.

Duncan, O.D., and Featherman, D.L.
1972 Psychological and Cultural Factors in the Process of Occupational Achievement. Social Science Research, 1 (June): 121-145.

Eckland, B.K.
1971 Social Class Structure and the Genetic Basis of Intelligence. In, Intelligence: Genetic and Environmental Influences. Edited by R. Cancro. New York: Grune and Stratton.

Farnen, R.F., Marklund, S., Oppenheim, A.N., and Torney, J.V.
n.d. Civic Education in Ten Countries: An Empirical Study. Stockholm: Almqvist and Wiksell (in Press).

Finn, J.D.
1972 Multivariance: Univariate and Multivariate Analysis of Variance, Covariance, and Regression User's Guide. Ann Arbor, Mich.: National Educational Resources.

Finn, J.D.
1974 A General Model for Multivariate Analysis. New York: Holt, Rinehart and Winston (in press).

Finney, J.
1972 Indirect Effects in Path Analysis. Sociological Methods and Research, 1 (November): 175-186.

Gouldner, A.W.
1970 The Coming Crisis of Western Sociology. New York: Basic Books.

Glick, O.
1970 Sixth Graders' Attitudes Toward School and Interpersonal Conditions in the Classroom. Journal of Experimental Education, 38: 17-22.

Goldberger, A.S. and Duncan, O.D. (eds.)
1973 Structural Equation Models in the Social Sciences. New York: Seminar Press.

Hannan, M.
1971 Aggregation and Disaggegation in Sociology. Lexington, Mass.: Heath.

Hannan, M. and Burstein, L.
1973 Estimation from Grouped Observations. Mimeo'd. Stanford University.

Harris, A.J.
1970 How to Increase Reading Ability: A Guide to Developmental Methods (5th edn.). New York: McKay.

Hauser, R.
1970 Context and Consex: A Cautionary Tale. American Journal of Sociology, 75: 645-664.

Hauser, R.
1971 Socioeconomic Background and Educational Performance. Washington, D.C.: American Sociological Association, Rose Monograph Series.

Hebb, D.O.
1949 The Organization of Behavior. New York: Wiley.

Hirst, P.H.
1966 Educational Theory. In J.W.Tibble (ed.), The Study of Education. London: Routledge and Kegan Paul.

Holtzman, W.H. and Brown, W.F.
1968 Evaluating the Study Habits and Attitudes of High School Students. Journal of Educational Psychology, 59: 404-409.

Husén, T. (ed.)
1967 International Study of Achievement in Mathematics, Vols. I and II. New York: Wiley.

Jackson, P.W. and Lahaderne, H.M.
1967 Scholastic Success and Attitude toward School in a Population of Sixth Graders. Journal of Educational Psychology, 58: 15-18.

Keeves, J.P.
1972 Educational Environment and Student Achievement. Stockholm: Almqvist & Wiksell.

Kerlinger, F.N., and Pedhazur, E.J.
1973 Multiple Regression in Behavioural Research. New York: Holt, Rinehart and Winston.

Khan, S.B.
1969 Affective Correlates of Academic Achievement. Journal of Educational Psychology, 60: 216-221.

Khan, S.B. and Roberts, D.M.
1970 Factorial Stability of Academically Relevant Affective Characteristics. Measurement and Evaluation in Guidance, 3: 209-212.

Khan, S.B. and Weiss, J.
1973 The Teaching of Affective Responses. Pp. 759-804, in, Second Handbook of Research in Teaching. Edited by R.M.W. Travers. Chicago: Rand McNally.

Kuhn, T.S.
1967 The Structure of Scientific Revolutions. Chicago: University of Chicago Press.

Kuder, G.F. and Richardson, M.W.
1937 The Theory and the Estimation of Test Reliabilities. Psychometrica, 2: 151-160

Lahaderne, H.M.
1968 Attitudinal and Intellectual Correlates of Attention: A Study of Four Sixth-Grade Classrooms. Journal of Educational Psychology, 59: 320-324.

Land, K.C.
1969 Principles of Path Analysis. Pp. 3-37 in, Sociological Methodology 1969. Edited by E.F. Borgatta and G.W.Bohrnstedt. San Fransisco: Jossey-Bass.

Lewis, E.G. and Massad, C.

n.d. English as a Foreign Language in Ten Countries: An Empirical Study. Stockholm: Almqvist & Wiksell.

Malpass, L.F.

1953 Some Relationships Between Students' Perceptions of School and their Achievement. Journal of Educational Psychology, 44: 475-482.

McDonald, A.S.

1960 Factors Affecting Reading Test Performance. Ninth year Book of the National Reading Conference: 29-35.

Neale, D.C. and Proshek, J.M.

1967 School Related Attitudes of Culturally Disadvantaged Elementary School Children. Journal of Educational Psychology, 58: 238-244.

Passow, A.H., Noah, H.J., and Eckstein, M.

n.d. The National Case Study: An Empirical Comparative Study of Twenty-One Educational Systems. Stockholm: Almqvist & Wiksell.

Peaker, G.F.

1967a The Regression Analysis of the National Survey. In Central Advisory Council for Education, Children and Their Primary Schools, Vol. 2, Appendix 4. London: Her Majesty's Stationary Office.

1967b The Dry Run and the Sampling Designs. IEA Technical Report Series B, No. 39, International Association for the Evaluation of Educational Achievement, University of Stockholm.

n.d. An Empirical Study of Education in Twenty-One Countries: A Technical Report. Stockholm: Almqvist & Wiksell.

Purves, A.C.
1973 Literature Education in Ten Countries. Stockholm: Almqvist & Wiksell.

Shores, H.J. and Husbands, K.L.
1950 Are Fast Readers The Best Readers? Elementary English, XXVII, 52-57.

Simon, W. and Gagnon, J.
1969 Psychosexual Development. Transaction, 6: 9-17.

Thorndike, R.L.
1973 Reading Comprehension Education in Fifteen Countries. Stockholm: Almqvist & Wiksell.
1973 The Relation of School Achievements to the Differences in the Backgrounds of Children. Paper presented at the Conference on Educational Achievement, Harvard University (November), mimeo'd. IEA, University of Stockholm.

Tenenbaum, S.
1944 Attitudes of Elementary School Children to School, Teachers and Classmates. Journal of Applied Psychology, 28: 134-141.

Tinker, M.A.
1939 Speed Versus Comprehension in Reading as Affected by Level of Difficulty. Journal of Educational Psychology, XXX: 81-94.

UNESCO
n.d. Books for All: A Program of Action. Paris: Book Promotion and Development Division.

BEST COPY AVAILABLE

Walker, D.A.

n.d. The IEA Six-Subject Survey: An Empirical Study of Education in Twenty-One Countries. Stockholm: Almqvist & Wiksell (forthcoming).

Wiley, D.E.

1973 Another Hour, Another Day: Quantity of Schooling, a Potent Path for Policy. Studies of Educational Processes, Report No. 3, MESA, Department of Education, University of Chicago.

Wiley, D.E., and Harnischfeger, A.

1974 Explosion of a Myth: Quantity of Schooling and Exposure to Instruction, Major Educational Vehicles. Studies of Educational Processes, Report No. 8, University of Chicago.

Williams, R.L.

1970 Personality, Ability and Achievement Correlates of Scholastic Attitudes. Journal of Educational Research, 63: 401-403.

Williams, T.

1973a Cultural Deprivation and Intelligence: Extensions of the Basic Model. Unpublished Ph.D. dissertation, University of Toronto, Canada.

1973b Cultural Deprivation and Intelligence. Paper read at the American Educational Research Association Meeting. Mimeo'd Department of Educational Foundations, Memorial University of Newfoundland, St. John's, Newfoundland.

1973c Abilities, Environments, and Attainments. Paper read at the American Sociological Association meeting. Mimeo'd Department of Educational Foundations, Memorial University of Newfoundland, St. John's, Newfoundland.

1974 Competence Dimensions of Family Environments. Paper read at the American Educational Research Association

BEST COPY AVAILABLE

Meeting. Mimeo'd Department of Educational Foundations, Memorial University of Newfoundland, St. John's, Newfoundland.

Winch, P.

1958 The Idea of a Social Science. London: Routledge and Kegan Paul.

Wright, S.

1960 Path Coefficients and Path regressions: Alternative or Complementary Concepts? Biometrics, 16: 189-202.

Yee, A.H.

1966 Factors Involved in Determining the Relationship Between Teachers' and Pupils' Attitudes. Texas: University of Texas.

1968 Source and Direction of Causal Influence in Teacher-Pupil Relationships. Journal of Educational Psychology, 59: 275-282.

Footnotes

1. In sociology, the monograph by Blalock (1964), and the papers by Boudon (1965) and Duncan (1966) which soon followed, set the stage. Important contributions have subsequently been made by Blalock's colleagues and students formerly at the University of North Carolina, and by Duncan's students formerly at the University of Michigan. Research in applied sociology from several centers soon followed. The pioneering work by Sewell and his colleagues at the University of Wisconsin is noteworthy. More recently the Jencks team at Harvard University have demonstrated the analytical power of causal modelling approaches in a series of monographs and papers. But these are only two among a score of possible examples, and are mentioned because their applications have been in the educational sphere.

Since the publication of the theoretical papers referred to, several collections of papers in causal modelling have appeared. Those by Blalock and Blalock (1968), Borgatta and Bohrnstedt (1969), Blalock (1971), Goldberger and Duncan (1973) are of major importance. The collections deal with the numerous extensions, refinements, and modifications to the basic technique as well as with some of the important issues, theoretical and substantive, that have inevitably arisen. The pace of these developments has been so rapid that there is as yet no general text available for the student. It is noteworthy in this writer's opinion that despite the pace of the numerous developments, the quality of the basic research work being done is with but few exceptions uniformly high. Kerlinger and Pedhazur (1973) present an uncomplicated introduction to path analysis within the context of the general

Footnotes cont'd.

regression model, and this work is recommended until researchers slow down inorder to evaluate and synthesize more specialized work in the field.

2. The notion of a paradigm-shift is Kuhnian, and refers to that complex of metaphysics, action theory, and methodology which forms the coherent background to the science of a particular time period, and which is usually given concrete expression in archetypal scientific work; for example Einstein's"general theory of relativity", or (perhaps) Hull's "principles of behavior". A paradigm-shift, then, is explicable in terms of a transition from one paradigm "the Old", to another, "the New". Since the advent of New Paradigms is inevitably accompanied by debate concerning their legitimacy (Kuhn 1967: 47-49), one may tend to infer too much from the current debate between conflicting schools of thought in, say, sociology.

Nevertheless, there is some evidence that the kind of critical debate Kuhn refers to exists in contemporaneous social science (for example, Winch, 1958; Gouldner, 1970). Gouldner's view, to take a single example is worked out (paradoxically) in the polemics of a so-called "activist" sociology. Rather quixotically he urges the trolls of the quantitative ("new") methodology to return to sociological matters in the manner of individual scholarship.

If historians of science subsequently verify the innovative trends in model building in the social sciences, which are currently conditioning scientific thought, as componerts of a paradigm shift, then there would seem to be a case for comparing the pioneering work of the British statistician R.A.Fisher -- inventor of the covariance model -- viz-a-viz the social and

Footnotes cont'd.

biomedical sciences with that of fellow-countryman Isaac Newton viz-a-viz the physical sciences and engineering.

3. The International Association for the Evaluation of Educational Achievement (IEA) is an autonomous, non-profit, non-governmental research organization. Its central staff, who coordinate IEA-related research activities at the national centers located in participating countries, are located at the University of Stockholm. Its research activities span almost a decade and have covered the core curricular areas of most national educational systems; namely, mathematics, science, reading comprehension, literature, civic education, English as a foreign language, and French as a foreign language. From eight to nineteen countries -- twenty-one in all -- participated in each subject by testing at one or more of three age levels: 10-year olds (Population I), 14-year olds (PopulationII), and those students in the last year of secondary school (Population IV). Major monographs include: Husén, vols. 1 and 2 (1967); Comber and Keeves (1973); Purves (1973); Thorndike (1973). A series of monographs dealing with aspects of the stage 3 surveys in civic education, English and French as foreign languages, are in press: Farnen, Marklund, Oppenheim, and Torney (forthcoming): Lewis and Massad (forthcoming); Carroll (forthcoming). A monograph comparing national educational systems in the IEA countries, a technical report, and a summary report are also in press: Passow, Noah, Eckstein (forthcoming); Peaker (forthcoming); and Walker (forthcoming).

Footnotes cont'd.

4. Schooling conceived as a process of resource conversion or modification is a relatively new idea which may not have gained much common currency. It is based upon the notion that in interpersonal interaction settings it is the transactions or exchanges that take place between actors that account for much behaviour. By school resources we are referring to all within-school factors which constiture assets or liabilities in generating those outcomes and behaviors of interest, such as scholastic achievements, attitudes of respect for one's fellow man, consideration of the interests of others, ability to assume responsibility and act rationally, and so on. Assets are those resources which are convertible into new resources. As means to ethical ends they constitute capital resources. Students who come to school with a readiness to learn, with a prior interest in selected school subjects, ready to assume responsibility for their own learning, and with a determination to pursue goals congruent with those constituting the aims of schooling, already possess personal resources which will be readily convertible by the application of within-school resources (conversion mechanisms) into achievement outcomes and desired value commitments. The school's conversion mechanisms include class exercises and drill, homework and study assignments, and such obvious factors as the length of the school day, the number of contact hours in the school year, the intensity and frequency of the interpersonal contact between teacher and student, knowledgeable teachers and the extent of their responsibility for the learning of the pupils. It is hypothesized that these conversion mechanisms coalesce to form relatively independent (orthogonal) learning dimensions such as:

Footnotes cont'd.

reward structures, opportunity to learn structures, expectations dimensions, and role model dimensions. An additional school resource of great potency is the peer group subculture, and the extent to which it is at odds with or congruent with the formal value framework of the school.

Liabilities are negative assets -- those personality attributes or within-school resources that impede resource conversion. Since even in the most equalitarian systems some school resources are likely to be extremely scarce, they are impossible to distribute equally. Thus, criteria have to be used on the basis of which unequal resource distribution is justified. On the whole there is a tendency for those students who do better to receive different treatment; thus, students who have done well in the past are likely to be treated differently in the future -- a process of double advantage since the different treatment will likely enable them to do better in the future.

5. In general, the following terms, all referring to outcome variables of primary interest are used synonymously in the literature: dependent variable, criterion or criterion measure, outcome, regressand, and output variable. By the same token, a variety of terms are used synonymously to refer to the independent variables: predictors or predictor variables, explanatory variables, factors, independent variables, regressor variables. In this paper, conceptual model nodules are usually referred to as components, while the path nodules at the main and auxiliary theory levels are referred to as independent variables or predictors.

Footnotes cont'd

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6. Finney (1972) and Charner and Cohen (1973) draw attention to some exceptions to this formula in the four or more variable model; where the total effect equals direct effect, plus indirect causal effect, plus noncausal indirect effect, plus spurious component, when the model is fully identified and an intervening variable is present. Charner and Cohen recommend that under these conditions analysts refer to total causal effects which are composed of direct effects and the indirect causal effect. When there are no intervening variables the total effect equals the direct effect plus a spurious component.

7. The four rules are not inviolate. Rather, their importance stems from the fact that if the analyst with intention breaks one, he ought to hold himself accountable. That is, in those instances where rule violation is deemed necessary in the context of the particular enquiry, it is incumbent on the researcher to justify his action by pointing out its consequences, and where possible drawing attention to compensatory practices.

8. Despite close reading of the extant literature on the relationship between reading rate and reading comprehension, there seems to be little or no consensus on the functional form of the relationship. One can infer from popular accounts, as stated above, that comprehension is dependent on rate. More informed accounts draw attention to the complexity of the relationship which is governed by a number of conditioning factors. Consider, for example, the possibility of interaction or multiplicative effects as depicted in Figure 3a.

Footnotes cont'd

Figure 3a about here

Figure 3a does not incorporate the possibility of nonlinear interaction, but is still based on the assumption that rate precedes comprehension. Some leading authorities suggest that the relationship is functional rather than causal, though seldom explicitly. For example, Harris (1970: 484) suggests a kind of functional reciprocity or interdependence.

> As the pupil learns through experience the degree of accuracy that is necessary in different kinds of reading, he will develop ability to adjust his rate to the requirements of his task. When comprehension is satisfactory but rate is below normal, the remedial teacher can concentrate his energies directly on the problem of increasing speed. This is the easiest of all remedial problems and one in which considerable improvement can be expected in most cases.

Harris' formulation would seem to support the notion of a degree of functional independence between rate and comprehension, and the desirability of maintaining the interdependence at some normatively acceptable (optimum) level. Since such relationships are captured by nonrecursive or reciprocal path models, the possibilities are depicted in Figure 3b.

Figure 3b about here

Neither Figure 3a nor 3b are tested here. Data is not available in the IEA data archive to examine such relationships as those hypothesized in Figure 3a; and Figure 3b is not tested because the reading speed variable was eventually eliminated from the revised form of the model. The reasons and implications of this decision are discussed below.

Footnotes cont'd

9. The reciprocal relationship between attitudes and achievements (that is, Kahn and Weiss' functional rather than causal relationship) is captured by a hypothetical model depicting a feedback loop as in Figure 4.

Figure 4 about here

10. The word knowledge test directions read as follows:

In this test words are given to you in pairs. In each pair, the two words have something in common. You must decide whether the words mean nearly the same thing, or nearly the opposite thing, with respect to what they have in common.

If you think the words have the same meaning, blacken in the oval marked "+" on your answer card.

If you think the words have opposite meaning, blacken in the oval marked "O" on your answer card.

Here is an example:

high low (+) (O)

The two words "high" and "low" both refer to height. However, they are nearly opposite in meaning. Therefore you should blacken in the oval marked "O" on your answer card.

For each of the following pairs blacken in either "+" or the "O". You should attempt every item for which you think you know the answer, but do not guess if you have no idea of the answer.

1. savory insipid (+) (O)
2. informed unaware (+) (O)
3. precarious stable (+) (O)
. . . .
. . . .
40. obvious indisputable (+) (O)

Footnotes cont'd

11. The item was number 55 on the student questionnaire, and read as follows:

About how many books are there in your home?
(Do not count newspapers or magazines)
Indicate one.

A. none B. 1 - 10 C. 11 - 25
D. 26 - 50 E. 51 or more

12. The directions for the reading speed test were as follows:

Here is a story. The story has many little parts. When you come to the end of a part there will be three words like this:

one two three

Put a line under the word that fits the story. For this test you underline the words in the booklet.

Read as fast as you can, and see how many parts of the story you can read and underline in the time that you have.

Remember -- read as fast as you can, but be sure to mark the right word after each part of the story.

Do not use an eraser. If you change your mind, cross out your first answer and then put a line under your second choice.

1. Peter has a little dog. The dog is black with a white spot on his back and one white leg. The color of Peter's dog is mostly

black brown gray

2. When Peter got the dog it was a small puppy. Now the dog is a little more than two years old. How many years has Peter had the dog?

one two three

Footnotes cont'd

13. The following excerpt is from the reading comprehension test.

If you were to begin to enumerate the various uses of paper, you would find the list almost without end. Yet, there was a time when this familiar item was a precious rarity, when the sheet of paper you now toss into the wastebasket without thinking would have been purchased at a great price and carefully preserved. Indeed, for long centuries in man's history, paper was unknown. People wrote on specially prepared sheepskins or goatskins called parchment.

About twenty-two hundred years ago, the Chinese people discovered how to manufacture paper from wood pulp. Later the secret reached Europe. But for many years, the whole operation was done by hand. Imagine making paper by hand, sheet by sheet! It was a reasonably simple process, but it is easy to see why paper was used only by the wealthy.

The first machine for making paper was invented by a Frenchman named Louis Robert. It was a crude machine by today's standards. Many European and American inventors have since contributed to the development of the more efficient papermaking machines now in use. In our time, paper is used throughout the world.

21. A long time ago people used parchment to write on because
    A. parchment lasted a long time.
    B. paper was unknown.
    C. paper tore too easily.
    D. parchment could be prepared easily.

22. The process of making paper was first discovered by
    A. an American.
    B. the French.
    C. the Chinese.
    D. Louis Robert.

23. Why was the process of making paper by hand unsatisfactory?
    A. It was too complicated.
    B. The paper was of poor quality.
    C. It was too slow.
    D. It was a secret.

24. We may conclude that, after Robert's invention, paper became
    A. cheaper.
    B. more valuable.
    C. stronger.
    D. rarer.

Footnotes cont'd

25. The main point that is being brought out by the first paragraph of this story is that
    A. it is only recently that paper has been widely available.
    B. for some uses parchment is better than paper.
    C. one can invent many different uses for paper.
    D. one should not throw paper in the waste basket.

26. The person who wrote this story was trying to
    A. amuse us.
    B. help us to learn something new.
    C. change how we feel about something.
    D. write something very pretty.

14. The liking for literature variable was based on an item on the student questionnaire which read as follows:

Listed below are a number of subjects studied in school. Indicate for each subject listed either that you have never studied it, or, if you have or are doing so now, the extent to which you like or dislike it.

Literature

A. Have never studied this subject
B. One of my favorite subjects
C. Have generally liked this subject
D. Have generally disliked this subject
E. One of the subjects I have liked least in school

15. The reading for pleasure variable was item 56 on the student questionnaire and read as follows:

About how many hours did you spend reading, just for your own pleasure, during last week (excluding comics)? Indicate one.

A. 0 hours
B. Less than or equal to 1 hour
C. Greater than 1 hour but less than or equal to 2 hours
D. Greater than 2 hours but less than or equal to 3 hours
E. Greater than 3 hours

Footnotes cont'd

16. There were 36 items on the two tests. These items included the subtests, literature comprehension and literature interpretation. The test used in the models analyzed in the paper was the total test consisting of the combined subtests. The correction for guessing formula was $C = r - W/k - 1$; where C is the corrected score, r the raw score, W the number of wrong items, and k the number of alternative answers (4 in each item).

The directions to each test were as follows:

On the next pages there is a short story. Read the story carefully and thoughtfully before going on to the questions about it.

Read the questions carefully and answer them as thoroughly and honestly as you can. The questions are preceded by instructions which you should follow. All your answers should be made on your answer card. You will not need any other paper on which to write.

If you have any questions ask your teacher.

The following excerpt is from the Achievement in literature test.

32. Which of the following best summarizes Mrs. O'Brian's attitude towards Mr. Ramirez in the early part of the story - up to line 81?

A. She had grown to love him and think of him as a part of her family.
B. She liked him as a tenant but did not have any strong feelings about him one way or another.
C. She did not like him because he was a foreigner.
D. She liked him but was afraid he might quarrel with her sons.

33. Which of the following comes nearest to what the writer thought of Mr. Ramirez?

A. A foreigner who should try to keep the laws of the country.
B. The unfortunate victim of official restrictions.
C. A well-behaved tenant for Mrs. O'Brian whom she would find hard to replace.
D. A simple-minded man who would in the long run be happier in his own country.

Footnotes cont'd

34. Who made the "soft knock" (line 1)?

A. Mr. Ramirez.
B. Mrs. O'Brian.
C. The policeman.
D. Mrs. O'Brian's son.

35. Which of the following best summarizes the sort of man Mr. Ramirez is?

A. Nervous and crafty.
B. Ambitious and industrious.
C. Sociable and popular.
D. Shy and gentle.

36. What is Mrs. O'Brian's first reaction to Mr. Ramirez's saying "I see you never"?

A. She cries.
B. She says good-bye.
C. She sits down.
D. None of the above.

37. In the context of the story as a whole, what is the significance of the last paragraph (lines 105 and 106)?

A. It shows that Mrs. O'Brian found Mr. Ramirez's English hard to understand.
B. It shows that Mrs. O'Brian finally understood what Mr. Ramirez's departure meant.
C. It shows that Mrs. O'Brian hoped Mr. Ramirez would come back to her house again.
D. It shows that Mrs. O'Brian had been so frightened by the police that she could do nothing.

17. The question -- number 41 on the student questionnaire -- read as follows:

Sex (Indicate one)

A. Boy
B. Girl

Footnotes cont'd

18. The question -- number 45 on the student questionnaire -- read as follows:

About how many hours of homework for all subjects do you do each week? (Indicate one)

A. None, and/or less than or equal to two
B. Greater than two but less than or equal to five
C. Greater than five but less than or equal to ten
D. Greater than ten but less than or equal to twenty
E. Greater than twenty

19. See above, pp. 14 - 20.

20. See above, p. 15.

21. Sarane S. Boocock has written a recent review of the literature on sex differences and school achievement (1972: chap. 5). Sex differences across countries are remarkably consistent according to the findings of IEA research. See, for example, the relevant sections of the following IEA monographs: on mathematics (Husén, 1967: 233 - 250); on science (Comber and Keeves, 1973: 256-267, 291-292, and esp. Tables 9.3, 9.4); on literature (Purves, 1973: 159-168, and esp. Table 6.1). Areas of sexual specialty seem to be as follows: boys outperform girls in mathematics and science; whereas the reverse is true in those subjects requiring verbal ability such as mother tongue literature but not to the same extent in reading comprehension.

Though descriptions of sex differences are available, there is a singular lack of explanation except

Footnotes cont'd

for socio-cultural explanations (e.g., Simon and Gagnon, 1969). But such explanations do no come to grips with the cross cultural finding that sex differences are remarkably stable across cultural settings and social groupings exhibiting considerable variation in socializing practices. The point is illustrated by examining Table 6.1 in the Purves monograph (1973). Differential aptitudes with possible genetic bases, or differential rates of neurological maturation are seemingly never considered. It is agreed that socialization theory is the single most profitable expository source on this question, but possibly not the only source, as the incongruencies in the data would suggest.

22. This coefficient was obtained from the bivariate printout in the data files at IEA International, University of Stockholm.

23. Where subgroups of respondents in complex data sets have different subgroup means on criterion measures, it is important to note that unless adjustments are made the common Pearson product-moment correlations will not be correct (Finn, in press). The errors can be corrected if the data is adjusted for the separate subgroup means, thereby giving within-group variances, covariances, and correlations which are the same as those computed for the total sample. Since the Finn multivariate program possesses this feature it was used in calculating the common within-groups matrix as the basis for the subsequent regression analyses (Finn, 1972). In this way, the bias which would have been present had the subgroup structure

Footnotes cont'd

based on sex and effort been ignored, was removed by pooling the within-groups measures.

24. Reference to the overall finding for sex differences in reading comprehension is made by Thorndike (1973a: 78); and in literature achievement by Purves (1973, Tables 6:1 and 6:5).

26. Cf. pp. 16-17, and especially footnote 8 and Figure 3a.

27. On this point see Hirst (1966).

28. See pp. 24-27.

TABLE 1

CORRELATION MATRIX OF MODEL I VARIABLES*

VARIABLE	X_1	X_2	X_3	X_4	X_{5a}	X_{5b}	X_6	BOYS (N=50) $\bar{X}$	BOYS (N=50) SD	GIRLS (N=69) $\bar{X}$	GIRLS (N=69) SD
X_1 VERBAL								16.04	8.61	15.53	8.81
X_2 LITHOME	.051							4.42	1.07	4.76	0.49
X_3 RDGRATE	.085	.286						35.88	5.55	36.04	4.74
X_4 RDGCOMP	.591	.256	.179					26.20	11.21	28.67	9.88
X_{5a} ATTIT 1	.05	-0.000	-0.072	.135				3.14	1.43	3.68	1.34
X_{5b} ATTIT 2	-0.20	-0.124	-0.016	-0.207	-0.308			9.28	8.67	3.17	7.50
X_6 LITACH	.43	.350	.190	.678	.126	-0.115		15.61	7.98	18.89	7.07

* After adjustment for within group sex differences

Where: X_1 VERBAL = Verbal ability

X_2 LITHOME = Number of books in home

X_3 RDGRATE = Reading speed

X_4 RDGCOMP = Reading comprehension

X_{5a} ATTIT 1 = Hours spent reading for pleasure per week

X_{5b} ATTIT 2 = Literary interest

X_6 LITACH = Achievement in literature

TABLE 2

MULTIVARIATE REGRESSION ANALYSIS OF READING COMPREHENSION AND ACHIEVEMENT IN LITERATURE REGRESSED ON SIX PREDICTOR VARIABLES§

IN-DEPENDENT VARIABLES	UNSTANDARDIZED REGRESSION COEFFICIENTS		STANDARDIZED BETAS		STANDARD ERROR OF REGRESSION		STEP	MULTI-VARIATE F-RATIO	P*	% ADDITIONAL VARIANCE EXPLAINED	
	RDGCOMP	LITACH	RDGCOMP	LITACH	RDGCOMP	LITACH				RDGCOMP	LITACH
X_1 VERBAL	0.661	0.344	0.551	0.402	0.088	0.068	1	31.073	0.0001	34.901	18.627
X_2 LITHOME	2.937	3.180	0.221	0.335	1.015	0.788	2	9.273	0.0002	5.129	10.800
X_3 RDGRATE	0.195	0.133	0.095	0.090	0.155	0.121	3	0.508	ns	0.463	0.409
X_4 HRSHWK	-1.544	-1.146	-0.121	-0.126	0.947	0.736	4	1.327	ns	1.150	1.119
X_5 ATTIT 1	0.876	0.760	0.116	0.141	0.575	0.447	5	1.167	ns	1.590	1.761
X_6 ATTIT 2	-0.038	0.051	-0.029	0.055	0.101	0.079					

RDGCOMP

MULTR 0.658

COEFFICIENT OF DETERMINATION ($100R^2$) . . . 43.23

LITACH

MULTR 0.572

COEFFICIENT OF DETERMINATION ($100R^2$) . . . 32.72

§ After adjusting for within group sex differences

* ns = not significant at the .01 level

TABLE 3

OBSERVED CELL MEANS AND STANDARD DEVIATIONS

FOR MODELS II AND III

		VERBAL		LITHOME		RDGCOMP		ATTIT 1		LITACH		CELL
SEX	HRSHWK	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	N
MALE	1	13.41	7.21	4.00	1.51	24.32	10.01	2.67	1.54	14.45	8.06	15
	2	19.69	8.61	4.50	0.86	29.98	10.90	3.23	1.27	17.35	8.06	26
	3	11.43	5.50	4.86	0.38	20.96	5.48	3.43	1.72	13.50	7.01	7
	4	6.00	0.0	5.00	0.0	-5.20	0.0	4.00	0.0	2.90	0.0	1
	5	3.00	0.0	5.0	0.0	24.00	0.0	5.0	0.0	15.60	0.0	1
FEMALE	1	15.14	7.58	4.64	0.63	26.14	11.61	4.0	1.24	17.56	7.28	14
	2	15.82	8.48	4.82	0.48	30.97	8.46	3.61	1.55	20.51	6.30	28
	3	15.80	8.95	4.76	0.44	28.42	9.50	3.52	1.19	18.29	7.23	25
	4	10.55	24.68	5.00	0.0	17.30	16.97	4.50	0.71	12.70	14.14	2
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0

TABLE 4

REGRESSION COEFFICIENTS IN STANDARD FORM SHOWING THE INFLUENCE ON ACHIEVEMENT IN LITERATURE IN MODEL II AFTER INTRODUCING EFFORT AS A SECOND DESIGN FACTOR§

DESIGN FACTOR(S)	DEPENDENT VARIABLE	STANDARDIZED COEFFICIENTS VERBAL	LITHOME	RDGCOMP	ATTIT 1	R^2	RESIDUAL
Sex only	RDGCOMP	0.579	0.227			.400	.775
Sex & Effort		0.548	0.273			.393	.781
Sex only	ATTIT 1	-0.052*	-0.043*	0.177		.021	.989
Sex & Effort		-0.065*	-0.121*	0.216**		.050	.975
Sex only	LITACH	0.081*	0.199	0.573	0.045*	.499	.707
Sex & Effort		0.093*	0.216	0.519	0.058*	.465	.728

§ Unless otherwise stated all relationships are significant at the .01 level or less.
* Not significant at the .05 or .01 levels.
** Significant at the .05 level only.

TABLE 5

REGRESSION COEFFICIENTS FOR MODEL III: ACHIEVEMENT IN LITERATURE

INDEPENDENT VARIABLES	DEPENDENT VARIABLES: READING COMPREHENSION RAW COEFFICIENT	READING COMPREHENSION STANDARD ERROR	READING COMPREHENSION PATH COEFFICIENT	LITERATURE ACHIEVEMENT RAW COEFFICIENT	LITERATURE ACHIEVEMENT STANDARD ERROR	LITERATURE ACHIEVEMENT PATH COEFFICIENT
X_1 VERBAL	.634	.087	.548	.078*	.075	.090
X_2 LITHOME	3.437	.947	.273	1.99	.713	.210
X_3 RDGCOMP				.401	.068	.534

RDGCOMP

Squared Multiple Correlation (R^2) . . . 0.393

Residual, $\sqrt{1-R^2}$ 0.779

LITACH

Squared Multiple Correlation (R^2) 0.462

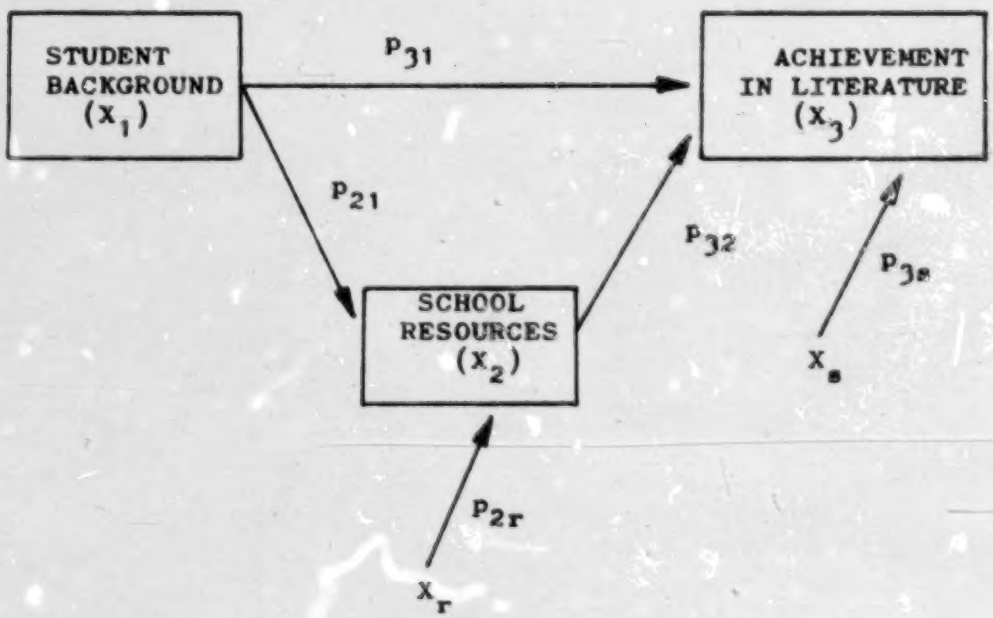
Residual, $1-R^2$ 0.733

* not significant at .01 level.

FIGURE 1

A SCHOOL RESOURCE MODEL OF

ACHIEVEMENT IN LITERATURE



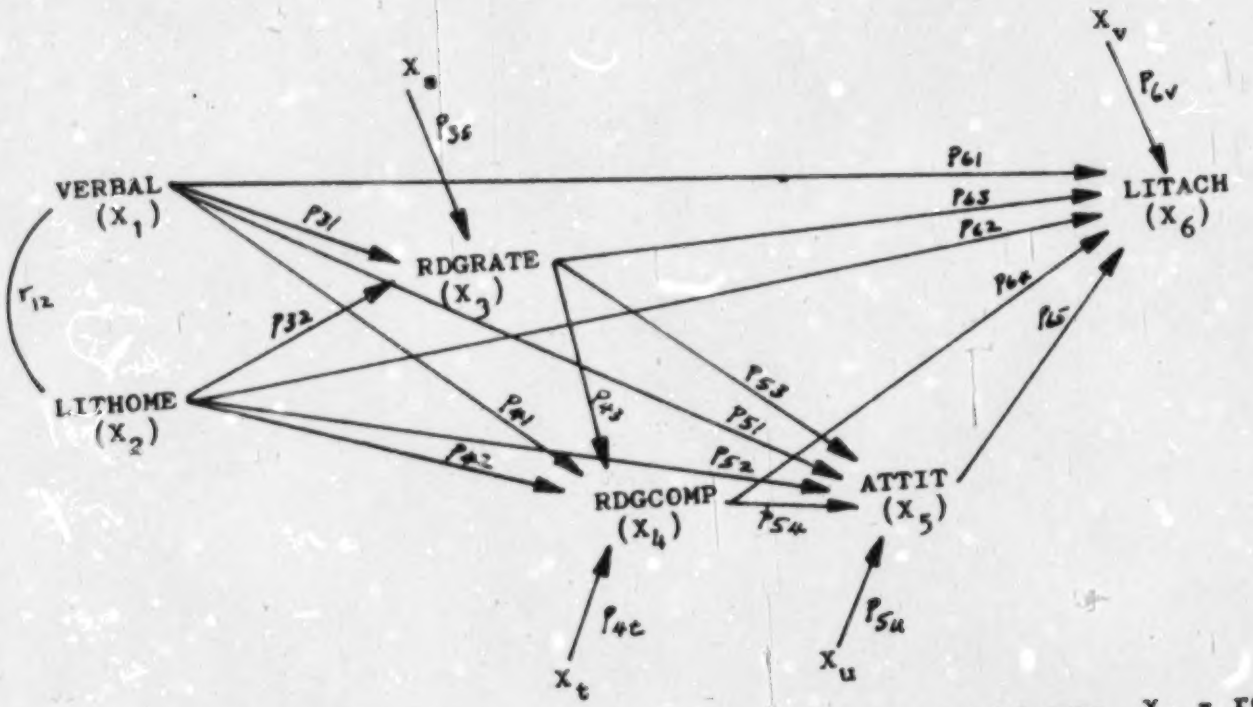
Path equations:

$$X_2 = p_{21}X_1 + p_{2r}X_r$$

$$X_3 = p_{32}X_2 + p_{31}X_1 + p_{3e}X_e$$

FIGURE 2

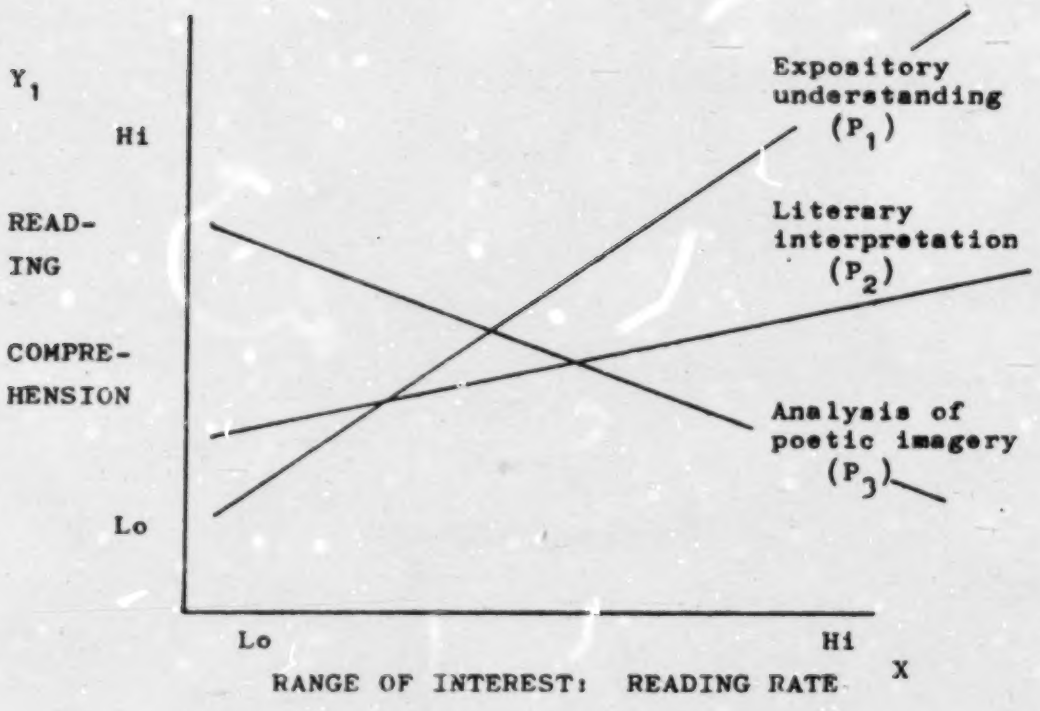
MODEL 1. THE ACHIEVEMENT PROCESS IN LITERATURE



Where: X_1 = verbal ability; X_2 = literacy level of home; X_3 = reading rate; X_4 = reading comprehension; X_5 = attitude toward literature; X_6 = achievement in literature; X_s, X_t, X_u, X_v = residual terms $\sqrt{1 - R^2}$, where R is the multiple correlation coefficient; and p_{ij} = the causal paths, where i = the number of the dependent variable, and j = the nuber of the independent variable.

FIGURE 3a

EFFECTS OF THE PURPOSE FOR READING LITERATURE ON READING COMPREHENSION ACROSS READING RATE AS A CONCOMITANT VARIABLE



$$Y_1 = b_0 + b_1P_1 + b_2P_2 + b_3P_3 + b_4P_1{*}X_1 + b_5P_2{*}X_1 + b_6P_3{*}X_1 + E$$

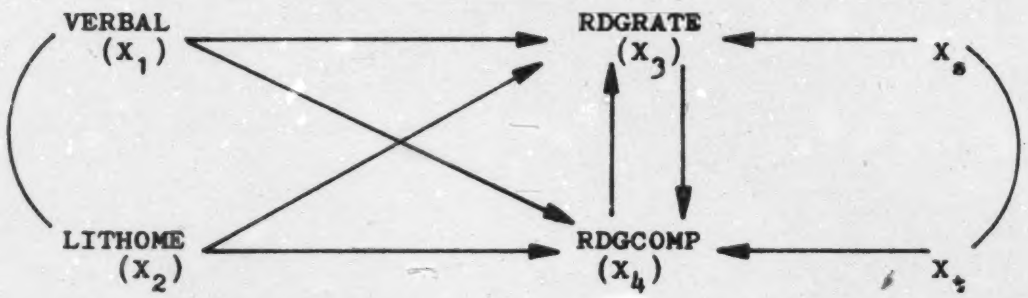
H_1: test for linear interaction; i.e., does $b_4 = b_5 = b_6 = 0$?

FIGURE 3b

RECIPROCAL PATH MODEL

ILLUSTRATING THE SIMULTANEOUS DETERMINATION

OF READING RATE AND READING COMPREHENSION



Where: X_1 = verbal ability; X_2 = literacy level of the home; X_3 = reading rate; X_4 = reading comprehension.

FIGURE 4

RECIPROCAL EFFECTS MODEL ILLUSTRATING RELATIONSHIPS
BETWEEN ATTITUDES TOWARD LITERATURE AND ACHIEVEMENT IN LITERATURE

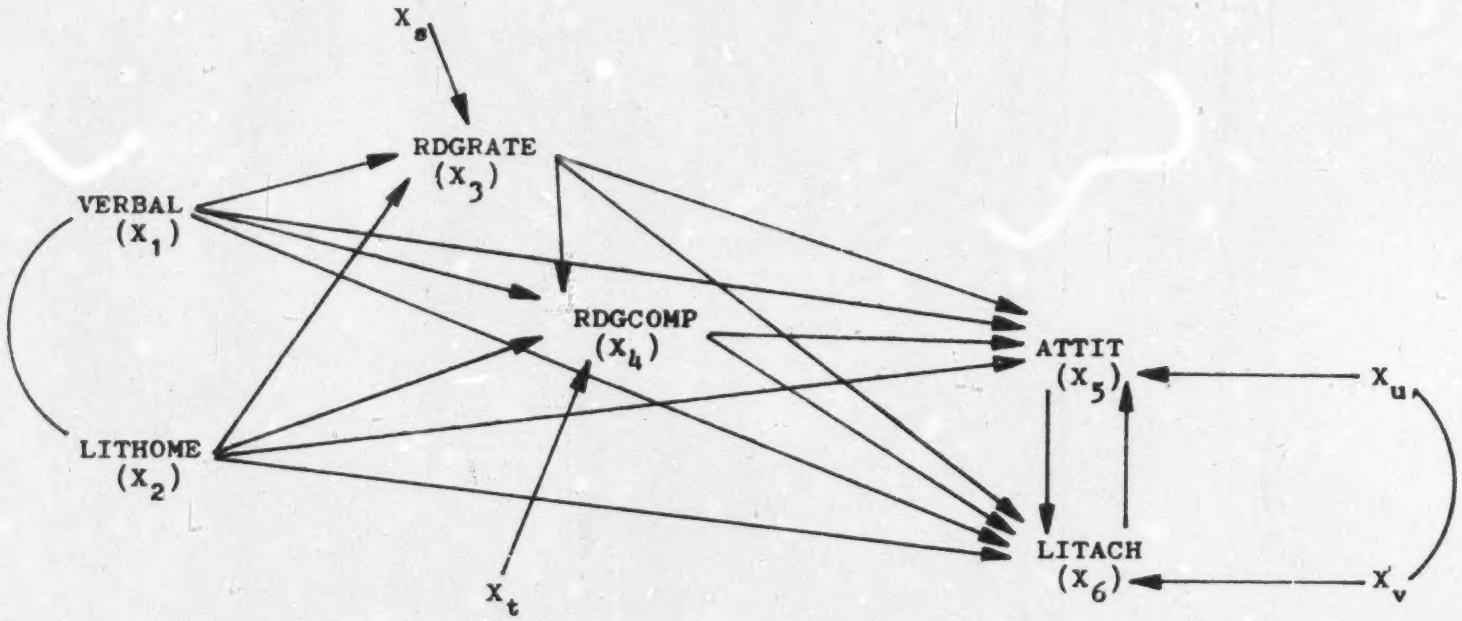


FIGURE 5

MULTIPLE INDICATOR MODELS OF UNMEASURED VARIABLES

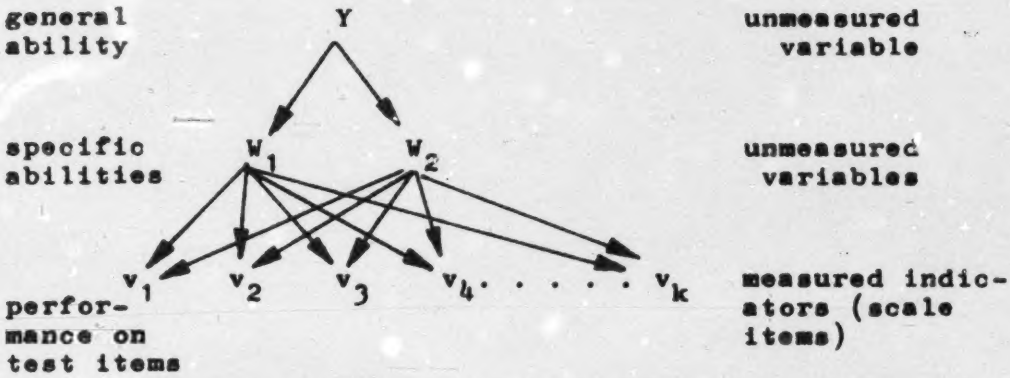


Fig. 5a: A Second Order Factor Model

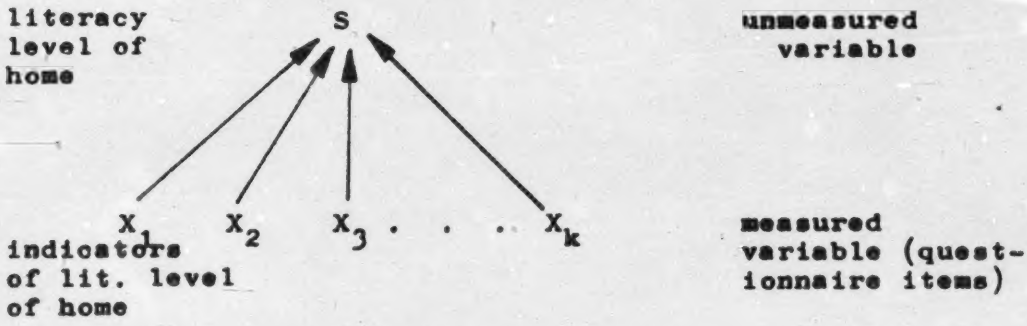
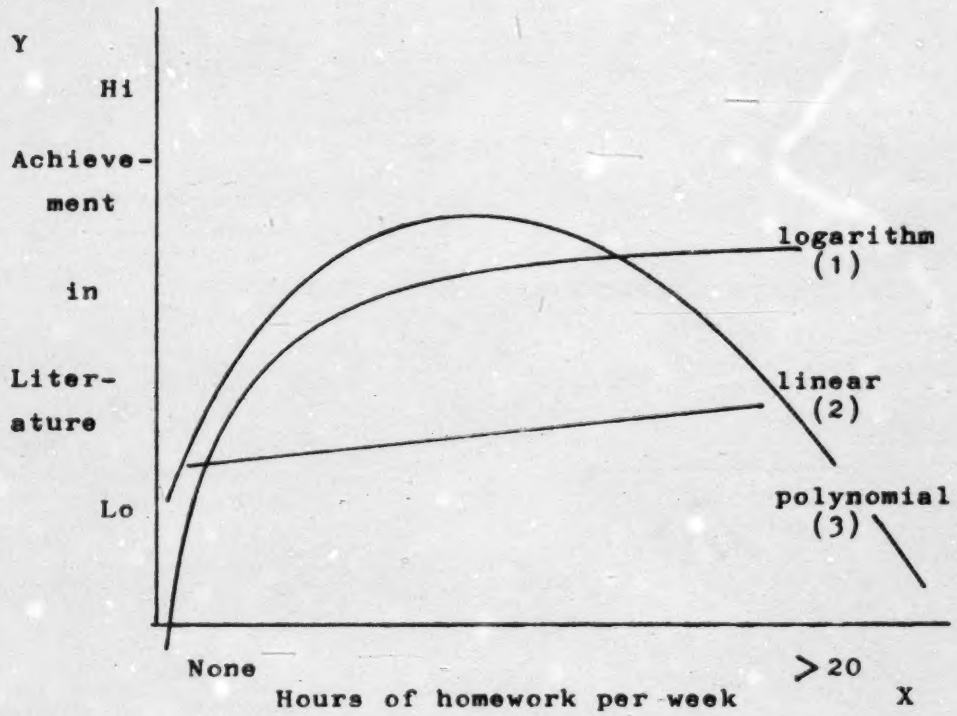


Fig. 5b: A Productive or Criterion Model

FIGURE 6

HYPOTHESIZED RELATIONSHIP BETWEEN ACHIEVEMENT IN LITERATURE AND HOURS OF HOMEWORK PER WEEK

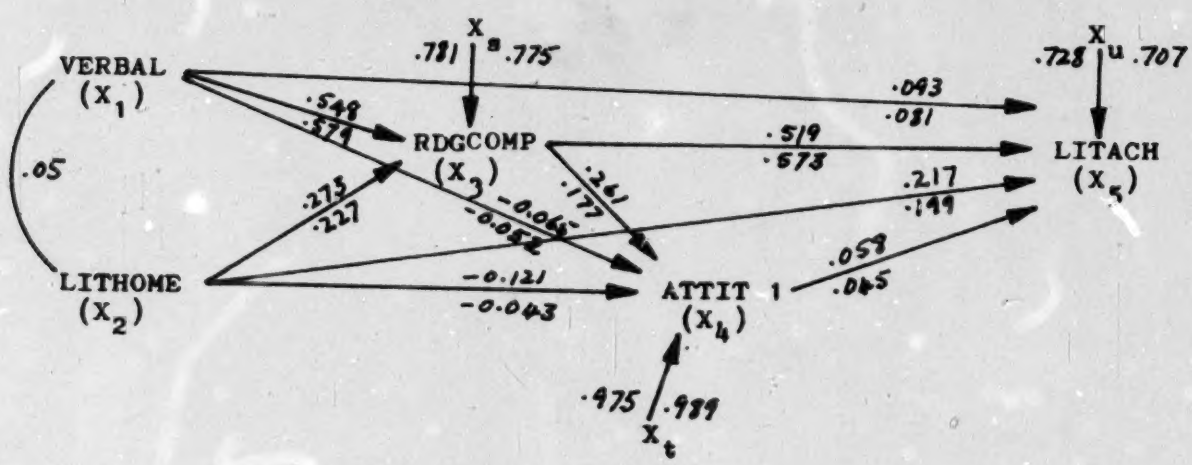


1. $Y = b_0 + b_1 \log X + e$ (logarithm)
2. $Y = b_0 + b_1 X + e$ (linear)
3. $Y = b_0 + b_1 X + b_2 X^2 + e$ (polynomial)

The IEA analysts examined the data for the possibility of the linear relation (no. 2) whereas there is some evidence that the best fitting relationship may be logarithmic or polynomial in form.

FIGURE 7

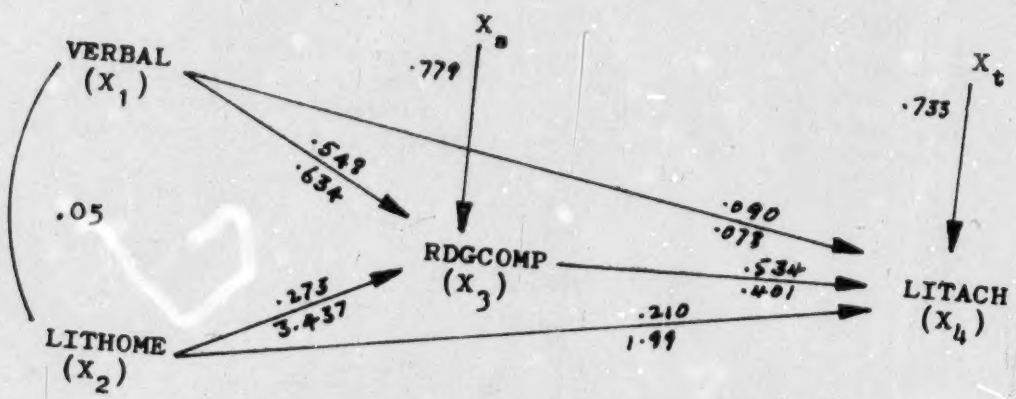
MODEL OF ABSOLUTE LEVELS OF ACHIEVEMENT IN MOTHER TONGUE LITERATURE (LITACH) ILLUSTRATIVE OF THE EFFECTS OF DESIGN FACTORS ON PATH COEFFICIENTS*



* The standardized path coefficients when sex is included as the single design factor are presented to the right, or below, the path arrows. The path coefficients when both sex and effort are included as design factors are presented to the left of, or above, the path arrows.

FIGURE 8

PATH DIAGRAM OF MODEL III RELATIONSHIPS:
LITERATURE ACHIEVEMENT PROCESS*



* After model revision by deleting reading speed and attitudes to literature, and after adjustments for the mean within-groups differences for sex and effort. The standardized path coefficients are shown above or to the left of the path arrows; the raw coefficients are shown below or to the right of the path arrows.